

The True Future of the Open Future

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Abstract

This thesis defends the ‘true-futurist’ view, according to which statements about the future are either true or false, even if the future is open and unsettled in some robust, objective and mind-independent sense.

A general argument for the validity of the principle of bivalence in the open future is advanced. The key feature of such argument is the ‘principle of retrospective determinacy’, stating that, for any proposition p , if it is now the case that p , then it was true that p would be the case. Different possible objections are discussed and dismissed. Second, two true-futurist theories are presented and shown to meet all the relevant *desiderata* of a true-futurist theory. In particular, much attention is devoted to the ‘problem of counterfactual evaluation’, concerning the truth-value of future-contingent statements in merely counterfactual scenarios. In addition, it is argued that the choice between the two true-futurist theories depends upon which metaphysical picture of time is assumed as true.

Some notable theoretical commitments of True-Futurism are examined. In particular, it is argued that True-Futurism is incompatible with two different ideas. The first one being that future-contingent statements (although bivalent) have an indefinite truth-value. The second one being that there are true ‘counterfactuals of openness’, stating that a certain future-contingent statement would have had a specific truth-value, had different circumstances obtained.

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Chapter 1

Introduction

1 Open Future and Bivalence

I. Suppose that the future is objectively ‘open’, and imagine that today, while it is unsettled whether it will be sunny tomorrow, I say

- (1) It will be sunny tomorrow

How is my statement to be evaluated? Along the history of philosophy (from Aristotle’s *De Interpretatione* to the contemporary debate on truth-relativism in; from medieval and modern philosophy to the birth of three-valued and supervaluationist logics) two main answers have been proposed to this question:

True-Futurism: future-contingent statements are *truth-valued* (either true or false)

Gappism: future-contingent statements are *gappy* (neither true nor false)

In this essay, I aim to defend the true-futurist thesis and argue that future-directed statements are either true or false, even if the future is open.

II. My inquiry about the *truth-status* of future-contingent statements (that is, their being either truth-valued or gappy) will, however, depart from the pattern that traditionally has animated the discussion on the open future and the principle of bivalence. As a matter of fact, one of the main questions featuring in the debate on future-contingents both in recent and ancient times has concerned the *compatibility* of bivalence and openness. How can, in fact, a statement *p* be now unsettled, even if it has—now!—a definite truth-value? If it

is *already* true today that a sea-battle will occur tomorrow, then it seems that tomorrow's occurrence of a sea-battle is something that *inevitably* will occur. In this essay, I will not address the question about the compatibility between open future and bivalence and simply assume that the future is open in the relevant sense. I shall, therefore, consider the results of my investigations as a reason to claim that if the principle of bivalence should turn out to be incompatible with the openness of the future, then we should conclude that the future is not open, but settled.

III. Although my defence of true-futurism will touch upon many different issues, its main core will consist in two steps:

- I. First, I shall advance a general argument for the validity of the principle of bivalence in the open future;
- II. second, I shall present two logico-semantic frameworks capable of accommodating what I will argue to be the main set of *desiderata* of any true-futurist theory.

The first step will have as its pivotal point what I shall call 'the principle of retrospective determinacy', according to which, if today it is the case that p , then it was true yesterday that p would be the case today. The second step will be mainly concerned with what I shall dub the 'problem of counterfactual evaluation' that is the problem of evaluating future-contingent statements in merely counterfactual situations.

IV. My inquiry will be as metaphysically neutral as possible.¹ I will not, in other words, assume any specific metaphysics of time to be the correct one. As I will show, however, the choice between the two true-futurist theories I will put forward depends on which metaphysical picture of time is assumed as true.

¹ See, however, section 2.6.2 below.

V. In this introductory chapter, I will expose the framework within which I shall conduct my discussion. In particular, I will explain what I shall take to be the correct conception of open future, and what claims I shall assume, for the sake of the argument, to be either true, or at least plausible. In the last section, I will provide a brief chapter-by-chapter overview of the essay.

2. Stage-setting

2.1 Mind-Independence

By saying that *the future is open* I mean that it is open in an objective, non-epistemic and mind-independent sense. One might in fact say that, even if the future were—in a sense to be specified—*objectively* settled, we could not, at least to a certain extent, know it. In this case, it seems that it would be correct to say that the future is—at least in some sense—‘open’.

This idea relies on the thesis that the future is intrinsically unknowable by us now and so—to borrow an expression coined by Roy Sorensen in his investigations over vagueness and pathological statements—it is an ‘epistemic island’ with respect to the present. However, in this essay I am concerned only with the *stronger* idea that the openness of the future does not depend on our ability of foreknowing it, but on some feature of reality itself. The question of what this feature exactly is, is for me irrelevant in this context: perhaps the future is objectively open because it does not exist; or because there exist many possible futures all ontologically on a par; or, again, only because the conjunction of the laws of nature and the present state of the world is insufficient to necessitate a unique future. What is important for my inquiry about the truth-status of future-contingent statements is only that the way in which the future is open does not depend in any way whatsoever on the existence of individuals having cognitive abilities. In other words, by assuming that the future is open, I am assuming that the future would have been as unsettled as it actually is, even if no individual capable of knowing had ever existed.

2.2 Asymmetry

We seem to intuitively feel that the future is open in a way in which the past is not. The past is ‘over and done with’ and so ‘there is no use crying over spilled milk’, or so they say. This feeling seems to be rooted in the belief that while present and future actions can have causal effect on the future, they cannot stand in the same kind of relation with the past. While, in other words, we seem to be free to decide what to do next, and so to deliberate whether to try and cause the future to be in a certain way, we strongly feel to lack the same kind of ability with respect to the past, so that the past appears to be ‘close’ and isolated from the present in a way the future is not.

Whether or not this family of intuitions is on the right track is an interesting and philosophically important question. However, what I am interested in is a mind-and-agent-independent notion of openness that does not depend on our having free will or on our being able to cause the past to be in a certain way.

Once the kind of relevant unsettledness of the future is intended in an objective and mind-independent way, the intuitions about an alleged asymmetry between the past and the future become less and less strong and the question about whether such an asymmetry really obtains appears to crucially depend on what is the mind-independent feature of reality that makes the future objectively unsettled. If, for instance, the openness of the future is thought of as depending on the fact that the future does not exist, then the question about whether the past is as open as the future boils down to the question about whether the past exists or not. If, instead, the future is thought to be open because it is not necessitated by the conjunction of the present state of the world and the laws of nature, then the past is open if it is also not so necessitated, etc. In this essay, however, I will leave this question on the side and assume—for simplicity’s sake—that the future is objectively open in a way that the past is not.

2.3 Unsettledness

The *open future thesis*—that is, the thesis that the future is open in some robust, objective way—is true if, and only if, for some future-directed proposition p , the following is true

$$(2) \quad \text{It is now-unsettled that } p \text{ and it is now-unsettled that } \sim p$$

What is it for a proposition p to be now-unsettled? In this essay I will define settledness by means of metaphysical necessity. Take '**Fut**' to be a variable ranging over proposition completely representing a possible way the future might turn out to be and '**the-Present**' to be a proposition completely representing the present state of the world. I will assume in this essay that to say that the future is open is to say that

$$(3) \quad \sim \exists \mathbf{Fut} \square (\mathbf{the-Present} \rightarrow \mathbf{Fut})$$

that is, that there is no complete description of the future such that it is metaphysically necessitated by the present state of the world. In turn, by 'the present state of the world' I mean the pattern of instantiation of fundamental n -ary relations that obtains among fundamental entities. Therefore, using '**Act**' for the operator 'it is actually the case that', '**Now**' for the operator 'it is now the case that' and ' $\langle x_1, x_2, \dots, x_n \rangle$ ' and ' R^n ' as variables ranging, respectively, over n -tuples of fundamental entities and n -ary fundamental relations, the open future thesis boils down to

$$(4) \quad \sim \exists \mathbf{Fut} \square (\forall \langle x_1, x_2, \dots, x_n \rangle \forall R^n (\mathbf{ActNow} R^n(x_1, x_2, \dots, x_n) \leftrightarrow R^n(x_1, x_2, \dots, x_n)) \rightarrow \mathbf{Fut})$$

Letting then '**N**' to stand for the operator 'it is now settled that', we can define the relevant notion of settledness in play in this essay as follows:

$$(5) \quad \mathbf{N}p =_{\text{df}} \square (\mathbf{the-Present} \rightarrow p)$$

from which follows immediately the thesis of the *necessity of the present*:

$$(6) \quad \mathbf{Nthe-Present}$$

which, in light of the notion of ‘state of the present’ can be unpacked as follows:

$$(7) \quad \forall \langle x_1, x_2, \dots, x_n \rangle \forall R^n (\mathbf{ActNow} R^n(x_1, x_2, \dots, x_n) \rightarrow NR^n(x_1, x_2, \dots, x_n))$$

that is: for any n -tuple of fundamental entities $\langle x_1, x_2, \dots, x_n \rangle$ and n -ary fundamental relation R^n , if it is now-actually the case that $R^n(x_1, x_2, \dots, x_n)$, then it is now settled that $R^n(x_1, x_2, \dots, x_n)$.

The definition given in (2) entails that there are at least two different (and, hence, incompatible) ways the future might turn out to be that are compossible with the present

$$(8) \quad \exists \mathbf{Fut1} \exists \mathbf{Fut2} [\Diamond(\mathbf{the-Present} \ \& \ \mathbf{Fut1}) \ \& \ \Diamond(\mathbf{the-Present} \ \& \ \mathbf{Fut2}) \ \& \ \Box(\mathbf{Fut1} \leftrightarrow \sim \mathbf{Fut2})]$$

(7) reflects the intuitive thought that the future’s being open consists in there being many possible futures ‘ahead of us’, that is many possible ways things might unfold in the future, once the present moment will have elapsed. Calling—as it is customary—the kind of modality associated with the N -operator ‘historical necessity’, (7) appears thus to legitimate the idea that to say that the future is open is thus to say that the modal space of historical possibility has a ‘tree-like’ shape and consists in a set of possible histories branching towards the future, as represented in figure 1.

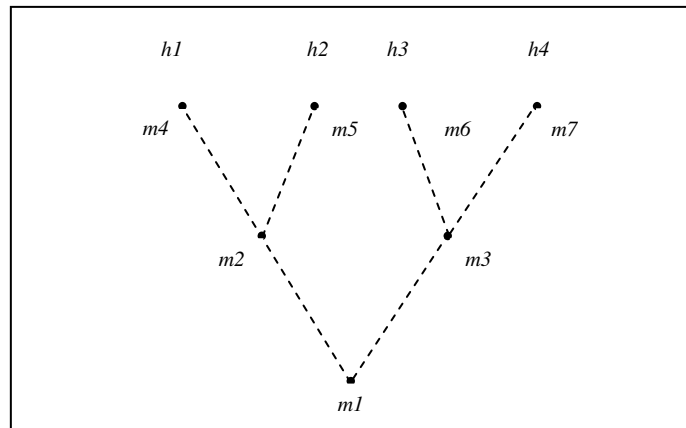


Figure 1

The nodes in the tree of branching historical possibilities are called ‘moments’ and intuitively represents possible (present) states of the world. They are ordered by a quasi-earlier/later relation that is irreflexive, asymmetric, transitive and left-linear. ‘Histories’, on the other hand, are linear chains of moments, intuitively representing possible ways things might unfold as time passes.

In this essay, the branching-tree picture will have a role of central importance. I will, in fact, assume—as it appears consistent with, and indeed entailed, by my other assumptions—that the future is open if, and only if, the modal space of historical possibility is a branching-tree of possible histories. However, until chapter 8 (in which I shall have something to say about the relation between different metaphysical models of time and the theories I will present in this essay), I shall not make any specific assumption about the nature of histories, leaving thus open the question about whether histories have to be thought of as *ersatz* abstract constructions (perhaps out of propositions) or *à la Lewis* as concrete worlds.

2.4 Open future and determinism

The *determinist thesis* is the thesis that the state of the world at any time t is necessitated by the conjunction of the laws of nature ‘ L ’ and the state of the world at any other time t' :

$$(9) \quad \Box[(L \ \& \ S(t')) \rightarrow S(t)]$$

It might be natural to think that, to say that the future is objectively open, entails that the determinist thesis is false. However, there appears to be at least a certain interpretation of the determinist thesis which seems to be actually compatible with the future’s being open. In this section I am to argue that, although potentially attractive, this thesis is false.

In order to explain how determinism and (historical) unsettledness can be compatible, I will focus—for simplicity’s sake—on the thesis, which is entailed by the determinist thesis, according to which the laws (L) and the present state of the world (P) necessitate the future (F)

$$(10) \quad \Box[(L \ \& \ P) \rightarrow F]$$

Suppose thus that F is the actual future and that F is not settled, being the future open

$$(11) \quad F \ \& \ \sim NF$$

From the definition of settledness it follows that necessity entails settledness, so that from (9) it follows that

$$(12) \quad N[(L \ \& \ P) \rightarrow F]$$

From (11), (12) and the principle stating that settledness is closed under entailment

$$(13) \quad \text{From } N(p \rightarrow q) \text{ and } Np, \text{ infer } Nq$$

it follows that also the conjunction between the present state of the world and the laws of nature is unsettled

$$(14) \quad \sim N(L \ \& \ P)$$

Given, however that the present is settled

$$(15) \quad NP$$

it follows that, if the future is open and determinism is true, then the laws of nature must be unsettled

$$(16) \quad \sim NL$$

But how can laws of nature be unsettled? As Barnes and Cameron (2009) point out, laws can be unsettled for those who uphold what John Perry (ms.) calls a ‘weak’ conception of laws, according to which laws are basically true generalizations. If that is the case, then the laws of nature L that obtain with respect to the actual history can differ from the laws of nature obtaining with respect to all other (merely) possible histories. Therefore, given that different futures are presently possible, and that the laws of nature depend on the way things will actually unfold, it follows that there are presently possible histories

having different laws of nature and, hence, that the laws of nature are presently unsettled.

However, it is easy to show that, if the future is open, then for the very definition of determinism and the fact that the laws of nature are contingent, it follows that no pair of histories whatsoever can share the same laws of nature. Suppose in fact that there are two possible histories $h1$ and $h2$ sharing the same laws of nature $L1$. In a branching model every pair of histories shares at least one moment. Therefore, there is a moment $m1$ such that $m1$ belongs both to $h1$ and to $h2$. Call $S(t1)$ the state of the world at $m1$. $S(t1)$ obtains (at m) with respect to both $h1$ and $h2$. Given the truth of determinism, however, it follows that any other state of the world $S(t^*)$ obtaining along either $h1$ or $h2$ is necessitated by the conjunction of $L1$ and $S(t1)$

$$(17) \quad \Box[(L1 \ \& \ S(t1) \rightarrow S(t^*))]$$

Hence, at every time, the very same state of the world must obtain both at $h1$ and $h2$, and, therefore, $h1$ and $h2$ are not different histories, contrary to what we have assumed.

The fact that, in a branching framework, if the determinist thesis is true, then each history has its own laws of nature entails that in a scenario in which the future is open and determinism is true, *super-determinism* is also true, that is the thesis that the actual laws of nature *L alone* necessitate the actual state of the world at (any) time t :

$$(SD) \quad \Box[L \rightarrow S(t)]$$

Suppose in fact that L are the actual laws of nature and $S(t)$ is the state of the world that actually obtains at a certain time t . Since, as we have just seen, in the framework we are actually considering, each history h has its own laws L_h , which are different from the laws $L_{h'}$ obtaining at any other history h' , it follows that for any possible history it is true that if the laws L obtain, then $S(t)$ is true.

However, the very idea that specifying the laws of nature is sufficient in order to determine—down to the least remarkable sub-atomic fact—the whole course of history appears to be an highly-implausible thesis that, at least to my

knowledge, no determinist has ever upheld. I think, therefore, that the moral that we should draw from the fact that, within a branching setting, weak determinism (the form of determinism embracing a weak conception of the laws of nature) entails super-determinism is that—at least in an open future setting—a stronger version of determinism is needed to really capture what we ordinarily mean by ‘determinism’. Such stronger conception—*strong determinism*—should add to the weak determinist thesis the requirement that the laws of nature be *settled*.

To say that the laws of nature must be settled, appears to entail the correctness of the following definition:

- (18) The laws of nature L , the present state of the world P and the future F are such that: $NL \ \& \ \Box[(L \ \& \ P) \rightarrow F]$

or more in general:

- (19) The laws of nature L and the true description $S(t)$ of the state of the world at t are such that: (i) NL and (ii) for every time t' , the true description $S(t')$ of the state of the world at t is such that $\Box[(L \ \& \ S(t)) \rightarrow S(t')]$

Strong determinism is clearly *incompatible* with the open future, as one would have expected determinism to be. According to such a conception of determinism, at any moment the laws of nature plus the present state of the world suffice to determine any state of the world at any other moment along the actual history, making thus impossible for there to be multiple possible futures. For this reason, although I will not discuss determinism in this essay, in the following chapters I will implicitly consider it as *incompatible* with the idea that the future is open and, hence, assume strong determinism as the correct definition of determinism.

2.5 Ungroundedness

According to the *grounding principle*

(G) Truth must be grounded in reality

If, in other words, a certain proposition p is true, then reality must, somehow, witness—as it were—the fact that p is true: truth cannot simply float on the void. There are two main ways to understand the notion of grounding. According to the *truthmaker principle*

(TM) If p is true, then there is some entity x such that x makes p true

according to the *supervenience principle*

(SUP) If p is true, then if p were false, there would be a difference with either the actual population of entities or the actual pattern of instantiation of properties and relations

Therefore, we could say that

(Gdf) A true proposition p is *grounded* if, and only if, p is either *truth-made* or *supervenient* (on the actual population of entities and the actual pattern of instantiation of properties and relations)

The grounding principle itself can be understood in different ways. If, for instance, we remain neutral on the kind of metaphysical framework underlying our theory, (G) seems to express a notion of *absolute* grounding, since no restriction whatsoever is explicitly put on the way in which p has to be grounded. Among the ways in which the grounding principle can be explicitly qualified, the following—which we might call the *principle of present grounding*—has specific relevance in this context:

(PG) Truth must be *presently* grounded

where for a true proposition p to be presently grounded, it must be either true that there is an entity x such that x presently exists and presently makes p true,

or that if p were false, then there would a difference with respect to either the present population of entities or the present pattern of instantiation of properties and relations.

As we have seen above, I am here assuming the principle of the necessity of the present (henceforth, ‘NP’). However, NP appears to entail that the principle of present grounding is false for true future-contingent statement. As a matter of fact, NP entails that the present population of entities and the present instantiation of fundamental properties and relations (that is: *the present state of the world*) is now settled. This, in turn, entails that according to every possible future the same present state of the world obtains. Suppose, then, that the future-contingent statement ‘ Fp ’ (standing for ‘it will be the case that p ’) is now true, and call ‘ s ’ the present state of the world. Since Fp is now-unsettled, there is some now-possible history h with respect to which Fp is false. However, since the present state of the world is settled, s obtains also with respect to h . On the other hand, it seems hardly questionable that the counterfactual histories passing through the present moment are among the closest histories to the actual one. Therefore, assuming the standard lewisian semantics for counterfactual, which in our framework should, at a first approximation, go along the lines of

- (20) ‘If it was the case that p , then it would be the case that q ’ if, and only if, in all the closest p -history, q is the case

it follows that the *principle of present supervenience*, according to which, for every proposition p , if p is now true, then

- (21) If p were now false, then the present state of the world would be different

is false.

Furthermore, consider the *principle of present truthmaking*

- (22) If p is true, then there presently exists an entity x such that it is now the case that x makes p true

To precisely cash out what the notion of truthmaking amounts to, is notoriously a difficult task. However, the following principle, linking the notion of truthmaking to the notion of settledness, appears to be intuitively valid:

(LP) If it is now the case that [x makes p true], then it is now settled that
[if x exists, then x makes p true]

However, it is easy to observe that if (LP) is indeed valid, then the necessity of the present entails that if there are true future-contingent statements, then the principle of present truthmaking is false. As a matter of fact, if it is true that x now exists and makes p true, then it follows from the principle of the necessity of the present that it is now settled that x exists. However, from LP it follows that it is now settled that if x exists, then x makes p true. Therefore, it is now settled that x exists and makes p true and, hence, that p is true, so that p cannot be a future-contingent statement.

Notice that, in order to deny LP in order to maintain that present truthmaking and true future-contingent statement are compatible is tantamount to claiming that, given a certain true future-contingent statement Fp , there is some x such that:

- x presently exists;
- x makes p true;
- in the now-possible histories in which Fp is false, x exists but does not make p true.

I found this position implausible for at least three reasons. First, I find it hard to imagine what kind of entity could possess this kind of historically-contingent truthmaking power. Second, to say that x makes p true but it is now possible that x exists, and x does not make p true (and p is false) seems to run against the principle of the necessity of the present, since the obtaining of the (present) truthmaking relation between x and p appears in fact to be part and parcel of the present state of the world. Finally, and most importantly, the very notion of

an historically contingent truthmaking power appears dubious: intuitively, if a fact or a proposition is historically contingent, it is something that it is not settled by the present state of the world, but that *will* somehow be settled by the way things will unfold. However, what only could settle whether x makes Fp true is, I submit, the fact that p will indeed be the case. But, if that were the case, we would have a case of vicious circularity, since although Fp would be indeed made true by x , the fact that x makes Fp true would ultimately depend on the fact that p will be the case. In other words, we would have a situation in which the truth of Fp depends on x , and the fact that it so depends, depends in turn on the fact that p will obtain, that is on the fact...*that* Fp ! However, the truthmaking relation should have at least some explanatory power, that is it should—somehow—explain *why* the proposition in question is true in non-vacuous terms. Rendering the truthmaking power of a proposition p 's truthmaker dependant on the fact that p is the case, would then make x play no role in explaining why p is true.

The principle of the necessity of the present appears, thus, to entail the falsity of the principle of present grounding. This result, however, shouldn't come as a surprise. As I said above, in fact, to say that the future is objectively open appears to be tantamount to saying that the way the future will be is not *pre*-determined by the present state of the world. However, to say that truth of a certain future-contingent proposition p is presently grounded is just to say that the present state of the world somehow *determines* the truth of p and, hence, the way things will go in the future. Hence, since the way in which the truth of a future-contingent proposition Fp would be determined by the present state of the world (were the principle of present grounding be valid) appears to be in tension with the lack of pre-determination that future-contingent statements should, as such, enjoy, it should be apparent that the presence of future-contingent statement actually commits open-futurists to the rejection of the principle of present grounding. In this essay, I will therefore assume the following principle:

(NPG) If future-contingent statements are truth-valued, their being truth-valued is not grounded on the present state of the world and,

therefore, if they are grounded at all, their ground must lie in some other region of reality (if any).

2.6 Present ungroundedness

2.6.1 No-futurism, presentism and the lack of present grounds

This essay is not concerned with a specific metaphysics of time, but aims instead to provide a general discussion and defence of the principle of bivalence in the open future, *prior to* any specific commitment to any particular metaphysical stance on temporality. However, the principle of the necessity of the present and the invalidity of the principle of present grounding might be seen as problematic with respect to some metaphysical positions. In this section I will discuss these alleged problems and argue that, among the main metaphysical models of time, only one proves to be immediately in contradiction with those assumptions.

Let us begin by considering the failure of the principle of present grounding. It must be stressed, for a start, that such a failure does not entail that open-futurists are committed to the thesis that future-contingent propositions are *absolutely* ungrounded. What the invalidity of the principle of present grounding entails is that, if future-contingent statements are grounded, they are not grounded in the present state of the world. Consider, then, an eternalist setting according to which past, present and future all atemporally exist, there is no objective form of ‘temporal becoming’ and the openness of the future just boils down to the fact that, for any time t , there is a set of ersatz possible-worlds overlapping with the actual world up to time t and branching onwards. Suppose that a certain statement S is a true future-contingent statement with respect to a certain time T_1 , concerning what will be the case at T_2 (a time later than T_1). The eternalist can consistently maintain that S is *locally ungrounded* with respect to time T_1 , but grounded *simpliciter*, since (taking, for simplicity’s sake, facts to be the grounds for truth) there is indeed a fact f , temporally located at T_2 , that grounds the truth of S . Eternalists can,

thus, avoid commitment to the principle of present grounding without offending the *grounding intuition*, that is the intuition that truth cannot simply float on the void and must be, somehow, tethered to reality.

A first tension arises with the so-called *growing-block theory*, that is the theory according to which past and present exist, the future does not and the objective passage of time consists in the successive increment of reality given by the coming into existence of later and later world time-slices. The growing-block theory is a *no-futurist* theory, that is a theory according to which the future does not exist and so, as such, cannot claim that the grounds of future-contingent statements is temporally dislocated in the future. Given their present-ungroundedness, they cannot be grounded in the present either. It would also seem implausible to suppose that their grounds are to be found in the past. It seems thus that growing-blockers have some trouble in respecting the grounding intuition.

However, growing-block theory is not immediately in contradiction with the grounding principle. As a matter of fact, growing-blockers takes *tenseless* discourse to be meaningful and, hence, they seem to acknowledge the existence of *atemporal* facts: An event *e*, for instance, occurs *tenselessly* at a time *t*, and so the occurrence of *e* at *t* can be seen, in itself, as an atemporal fact. Therefore, it seems that—assuming again, for simplicity's sake, facts to play the role of grounds for truths—the growing-blocker has at least the possibility to try and salvage the validity of the grounding principle by invoking atemporal facts as grounds for future-contingent statements. If, in fact, the ground for a future-contingent statement is not something that obtains now but is instead an atemporal fact, one cannot derive from the principle of the necessity of the present that the future is settled. Of course, explaining what these alleged atemporal facts are and how they manage to provide an adequate grounding for future-contingent truths might prove to be too difficult a task for growing block theorists. Nevertheless, it remains a possibility that shows how the growing-block theory *alone* is not *per se* incompatible with the grounding intuition.

There is a dynamic theory of time that appears to be immediately in contradiction with the grounding principle, at least if its characterizing slogan

is taken at face value. Such a theory is *presentism*. According to presentists, every entity is a present entity, that is:

(Pr) For all x , (if x exists, then) x is present

For the presentist, the boundaries of the present are the very boundaries of reality. Hence, since future contingent-statements are not grounded in the present state of the world, it follows not only that future-contingent statements are presently ungrounded, but also that they are ungrounded *simpliciter*, thus contradicting the grounding principle.

The argument just exposed depends on the validity, within a presentist setting, of the principle of present grounding:

(PG) Truth must be *presently* grounded

Hence, whether or not presentism is incompatible with what True-Futurism depends on whether (PG) is indeed a valid and unquestionable principle. However, in the recent literature on grounding principles, more and more authors are putting forward different lines of criticism to the idea that every truth must be grounded in reality:

I. One of the most intriguing reasons that have been recently offered to doubt the universal validity of the grounding principle comes from the recent literature on semantic paradoxes. Consider in fact the following sentences (the *truth-teller* and the *no-no sentences*):

This sentence is true

The neighbouring sentence is not true

The neighbouring sentence is not true

These sentences appear to be affected by the same *pathological* feature: the truth-teller can consistently possess either truth-value; the no-no sentences can tolerate divergent assignments (T-F, F-T); however, in both cases, not only it appears impossible to come to know their truth-value (either via proof or

empirical investigation), but there also seems to be nothing that could determine which is the correct assignment. While the *liar*

This sentence is false

and (what we might call) the *yes-no sentences*

The neighbouring sentence is true

The neighbouring sentence is not true

suffer from *inconsistency* (not tolerating any truth-value assignment), the truth-teller and the no-no pair display a kind of pathological *indeterminacy* (tolerating too many truth-value assignments, while there being seemingly nothing to determine which is the correct one). Roy Sorensen (2001) has offered an interesting solution to this puzzle, which—briefly stated—consists in (i) rejecting the universal validity of the grounding principle, (ii) take the truth-teller and the no-no sentences to have ungrounded truth-values and (iii) to be, for this very reason. metaphysically unknowable

If 'This is true' is true, then it is an epistemic island. There is no access to its truthmaker to the truth of the truth-teller.

The [no-no sentences] constitute a more complex epistemic island. [...] both members are absolutely unknowable, because there is no way to learn the truth-value of any particular member. (Sorensen, 2001, p. 175)

Sorensen's solution to the puzzle posed by the truth-teller and the no-no sentences is not only independently interesting—as a way of dealing with a specific class of pathological sentences—but calls for attention also for a further reason. According to Sorensen, his 'truthmaker gap' treatment of the truth-teller and the no-no sentences constitutes in fact 'a precedent for an epistemic solution to the sorites paradox' (2001, p.176) according to which

- (i) vague predicates admit sharp cut-offs (there is a number n such that it is both true that n seconds after noon is noonish and that $n+1$ seconds after noon is not noonish)
- (ii) it is metaphysically impossible to know the truth-value of cut-off sentences (vagueness gives rise to *absolute ignorance*)
- (iii) cut-off sentences are metaphysically unknowable because they possess a *groundless* truth-value: they are true/false without having a truth/false-maker.

As he himself puts it,

[since] the believer in the truthmaker gap solution to the no-no paradox has already accepted a T-F assignment for a perfectly symmetrical pair of sentences[, ...] he will not oppose the possibility that a particular threshold for ‘noonish’ groundlessly exists. Just as there is absolutely no way to know which no-no sentence is true, the threshold for ‘noonish’ is absolutely unknowable (Sorensen, 2001, p. 176).

II. Beyond semantic paradoxes, in recent years the universal validity of grounding principles has been questioned for a broad range of cases: Modality, negative existentials, and dispositional counterfactuals, among others. Authors like Jonathan Tallant and Trenton Merricks, for instance, have advocated either the rejection or a significant reformulation of grounding principles.

Tallant defends the view that the rejection of classical grounding principles (in favour of a view he dubs ‘No-Ground Cheating’ (NGC)) is motivated by ontological parsimony:

The most obvious point in favour of NGC is ontological parsimony. Because we ‘cheat’ by not providing ontological ground for talk about absences, negative existentials, times other than the present, and possibilities, we can dispense with a multitude of ontological commitments. Since we regard our best

theories as those that are most ontologically parsimonious, we ought to prefer NGC to ontologies that provide grounds. (Tallant, 2009: 425)

[...] what the proponent of NGC must argue is that it is better to have complexity in our conceptual framework than it is to have complexity in the world. Thus, the no-ground cheat thinks it is better to say that:

NGC-ST: a proposition is true if and only if, either: (a) there exists an entity that makes that proposition true; or, (b) there does not exist an entity and that makes the proposition true; or, (c) there could have existed an entity that would make the proposition true; or, (d) there has existed an entity that makes the proposition true . . .

rather than endorse a theory that commits to ontological grounds in each of the relevant domains of discourse. (Tallant, 2009: 426)

Merricks, instead, has mounted against the principle of grounding what we might call an ‘argument from aboutness’, which is well summarised by the following passage of Jonathan Schaffer:

First, Merricks argues that the best account of truthmaking involves both necessitation and aboutness, as per:

TNec: $(\forall p)(\forall w)$ (if p is true at w then $(\exists x)$ (x exists at w & x is not suspicious & $(\forall w')$ (if x exists at w' then p is true at w') & p is about x))

Necessitation is imposed in the third conjunct under the existential quantifier, where x is required to be such that at all worlds where x exists p is true. Aboutness is imposed in the fourth conjunct under the existential quantifier, where x is required to be what p is about. Thus: “every truth is necessitated by, and is about, the positive existence of this or that . . .”

Merricks then argues that **TNec** fails, primarily because negative existentials, modals, and claims about the past and future are not about what is, but rather about what is not, what might be, and what was and will be. Merricks thus concludes that truth does not depend on what there is, and also sees in this

refutation of the correspondence theory of truth [...], and ultimately a rationale for truth primitivism. (Schaffer, 2008: 302-3).

II. Furthermore, regardless the question of the open future, presentism has already troubles with the grounding principles for what concerns true statements *about the past*. To this effect, many authors have tried and defend presentism from the ‘grounding objection’ by advancing different proposals about what could ground the truth of past-directed statements.² Recently, however, many authors have argued that the real solution to the grounding problem lies in the very restriction or significant reformulation of the grounding principle. Beyond Tallant and Merricks (see above), the most recent and interesting attack to the grounding principle has come from Caplan and Sanson (2010) and Kierland and Morton (2007):

Consider the proposition—call it ‘A’—that Arnold was pale. A, it seems, is a true proposition.[...W]e have two candidate explanations of the truth of A:

(PRESENT) The proposition that Arnold was pale is true because Arnold now has the property having been pale.

(PAST) The proposition that Arnold was pale is true because Arnold once had the property being pale.

It seems to us that (PAST) is a proper explanation of the truth of A; and it seems to us that, once this is recognized, it becomes clear that (PRESENT) is not. [...] It is because Arnold once had the property being pale that he now has the property having being pale. But the reverse is not the case: it is not because Arnold now has the property having being pale that he once had the property being pale. To put the point metaphorically, that he now has the property having been pale is at best a symptom of the (unsightly) property he once had: being pale. (Caplan and Sanson, 2010: 2—5)

2

(BSP) [*‘Truth supervenes on things and how things are.’*] is not intuitively plausible, although it can seem otherwise.[...] (BSP) is formulated by ignoring issues of time, and then when it is applied to issues of time, we find that—lo and behold!—one of our intuitive views must be rejected. [...] Of course, this will not move anyone who does not agree that (III), i.e., presentism, captures our intuitive view of time. But those who offer the objection from being-supervenience against presentism need to make a positive case for (BSP).

So, as we see it, there is no independent objection here given the possibility of some sort of thing/property/time metaphysics. According to such metaphysics, the past is an aspect of reality, but it cannot be reduced to things or the properties they possess (i.e., how these things are). Call this *brute past presentism*; [...] On this view, then, what is the past? It is what has happened: what things existed and how they were. But what is that? To ask that question is to presuppose that the past must be explainable in other terms. And this presupposition may simply be false.

The brute past has an intrinsic nature [...] a certain ‘shape’. This shape does not consist in a structure of things having properties and standing in relations to one another. The past is an aspect of reality, even though no past things are. How can this be? There is no reductive explanatory answer to this question. The crucial feature of brute past presentism is that it postulates a *sui generis* metaphysical category, one independent of things and how they are. (Kierland and Morton 2007: 490—491)

IV. Finally, a rejection or significant reformulation the grounding principles has been proposed with respect to the open future itself. On the one hand, for instance, Ross Cameron (2010) has advanced a truthmaking theory for presentist which solves the problem just sketched by appealing to the idea of *ontic indeterminacy*. According to Cameron’s proposal, future-contingent statements do have a truthmaker, but it is *ontically indeterminate* and so insufficient to settle the future. While it is in other words true that

(23) *It is (now)determinately the case that, there is an x, such that x makes Fp true*

(where *Fp* is a future-contingent statement) it is false that

- (24) There is an x such that *it is (now) determinately the case that x makes Fp true*

Therefore, since plausibly settledness entails definiteness

- (25) If it is settled that p , then it is (now) determinately the case that Fp ³

it follows that

- (26) There is no x such that it is now settled that x makes Fp true

and, hence, that Fp is now unsettled.

On the other hand, Patrick Greenough (ms) has recently proposed a theory for the open future according to which:

- (27) Future-contingent statements are indeterminately true(/false),

where, roughly,

- (28) A statement p is indeterminately true(/false) if, and only if, p is true(/false) but there is nothing to ground the truth(/falsity) of p .⁴

Of course, the presence in the recent literature of a growing scepticism for what concerns the grounding principle both in general and especially with connection to presentism does not alone suffice to give us grounds to reject it. I think it is, however, sufficient to prove that the grounding principle is in itself disputable, and that it is not implausible that in the seemingly inconsistent triad

- Future-directed statements are bivalent
- The future is objectively open

³ Cameron does not seem to explicitly state this principle. I think, however this is a charitable reconstruction of the lines of reasoning underlying his main argument for the compatibility between presentism, the grounding principle and the open future.

⁴ See chapter 4.

- Truth must be presently grounded

the principle of present grounding is the element that has to be rejected. For this reason, I will consider as an option for presentists (and for all other theorists of time which might appear to be committed to the principle of present grounding, once the principle of grounding is accepted) the idea that future-contingent statements have an ungrounded truth-value and, hence, I will not consider presentism as immediately at odds with True-Futurism.

2.6.2 Moving spotlight and the necessity of the (hyper-)present

Let us take stock. So far, I have characterized the framework within which I will conduct my investigation by means of two main thesis:

- (i) future-contingent statements, if true, are presently ungrounded;
- (ii) the present state of the world is now-settled.

Furthermore, I have announced that the discussion I will put forward in this essay will not be concerned with a specific metaphysics of time and that, in general, most of the claims I shall be arguing for are thought of as neutral with respect to the question as to which is the correct metaphysical stance on time. To this effect, in the last section I have argued that there are at least plausible reasons to suppose that *eternalism*, the *growing-block theory* and *presentism* are not immediately threatened by the thesis that future-contingent proposition are presently ungrounded.

In this section, I am going to argue that—under quite modest assumptions—the principle of the necessity of the present is incompatible with the metaphysical view on time commonly known as the *moving spotlight theory*, to the effect that such a theory will be assumed in this essay to be the only metaphysical theory of time (among the most prominent ones) which

appears to be incompatible with the idea that the future is open and that the principle of bivalence is unrestrictedly valid.

According to the *moving spotlight theory*⁵, past, present and future times all equally exist, as the eternalist claims. However, in addition to the eternalist ontology, the moving spotlight theorist posits the existence of a fundamental property of ‘presentness’ which both ‘illuminates’ a unique time on the eternalist block and together ‘moves on’ to later and later time as ‘time passes’. In other words, the movement of the ‘moving spotlight’ of the present represents the A-theoretic, objective temporal passage in which times themselves undergo a change from being non-present to being present and from being present to being non-present.

The moving spotlight theory—appealing as it might be to those who are both attracted by the advantages of eternalism over presentism and the growing-block theory, but still believe in the objective reality of temporal passage—presents an immediate difficulty which their upholders are called to address. According to MST, in fact, each existing time *acquires* and *loses* the property of being present. Hence, it appears that, for all times t , it is both true to say that

(29) t is present

and

(30) t is not present

whence a contradiction.

The only way for the MST-theorist to solve this contradiction (which is clearly at least close to the contradiction featuring in the famous McTaggart’s argument for the unreality of time)⁶, appears that of distinguishing the *temporal respects* according to which t is, and is not present, respectively. As a matter of fact, the MST-theorist can reply, it is not true that t is both present and non-present *simpliciter*. What is true, instead, is that, for instance, *first* t is non-present and *then* it becomes present, or that t *is now* present and *was* non-

⁵ For a classical presentation of the moving spotlight theory, see Schlesinger (1991).

⁶ See McTaggart (1908).

present. After all, the process in which times acquire and lose the property of presentness is thought of by the MST-theorist as the A-theoretically, *temporal* and dynamic aspect of reality.

Since the respects with respect to which t is and is not present respectively have a temporal nature I see only two main kind of options for the MST-theorist to overcome the contradiction displayed above:

- (I) The truth of ' t is present' and ' t is not present' is relative to the *times* that compose the eternalist world-block featuring in her theory. What is correct to say is not, therefore, that t is(/not) present *simpliciter* but rather that t is present *with respect to t* and t is not-present with respect to any time t' different from t
- (II) the change in presentness undergone by each time t occurs in *hyper-time*, that is the higher-order temporal dimension in which (hypo-)times undergo change

In turn, the second option comes in two flavours, depending on whether hyper-time is conceived A- or B-theoretically:

- (IIA) If hyper-time is conceived A-theoretically, then MST-theorists can use *hyper-temporal* operators and claim that, for instance: *it is hyper-now the case* that t is present, but *it hyper-was the case* that t is not-present.
- (IIB) If hyper-time is conceived B-theoretically, then the truth of ' t is present' and ' t is not present' can be relativized to *hyper-times*. In this case, the MST-theorist can claim that t is present with respect to hyper-time T1 and t is not present with respect to hyper-time T2

In order to show how the moving-spotlight theory is incompatible with the open future, I will consider option IIB, that is the case the contradiction is solved by appealing to an eternalist hyper-time. It will then easy to see how my argument applies also to the other cases.

My argument rests on four main assumptions about hyper-time and its connection with hypo-time:

- (H1) For all hyper-times T , the state of the world at T is hyper-settled at T (we can call this the *principle of the necessity of the hyper-present*)
- (H2) Necessarily, hypo-times and their earlier-later ordering are hyper-eternal: In other words, hypo-times cannot begin and cease to exist in hyper-time nor can they change their earlier-later ordering
- (H3) If t is present at T and it is hyper-settled at T that, at T' , t' will be present, then it is also hypo-settled at t that t' will obtain (*if the hyper-future is settled, then the hypo-future is also settled*)
- (H4) (Assuming for simplicity' sake that both hypo-time and hyper-time are discrete) for every hypo-time $t1$ and $t2$ and hyper-time $T1$ and $T2$, such that (i) $t1$ is hypo-earlier than $t2$, (ii) $T1$ is hyper-earlier than $T2$, (iii) no hypo-time is both hypo-earlier than $t2$ and hypo-later than $t1$ and (iv) no hyper-time is both hyper-earlier than $T2$ and hyper-later than $T1$, *necessarily, if $t1$ is present at $T1$, then $t2$ is present at $T2$*

Furthermore, my argument will rely also on the following intuitively valid rule of inference

- (Z1) From $\Box(p \rightarrow q)$ and $N_{T/t}p$, infer $N_{T/t}q$

The argument goes as follows:

ARGUMENT A

- T and T' are variables for hyper-times;
- t and t' are variables for hypo-times;
- $T1$, $T2$, $t1$ and $t2$ are hyper- and hypo-temporal parameters respectively;
- $x < y$ stands for 'y is the hyper/hypo-time that immediately follows x';
- x and P are usual variables for entities and properties;

- **Present**(x) and **Obtains**(x) stand for ‘ x is present’ and ‘ x obtains’ respectively;
- **at-T**: is the operator ‘it is the case at the hyper-time T that’;
- N_t is the (hypo-)historical necessity operator ‘it is (hypo-)settled at t that’;
- N_T is the hyper-historical necessity operator ‘it is hyper-settled at T that’.

- (A1) $\forall x \forall P \forall T (\mathbf{at-T}: Px \rightarrow N_T Px)$ [premiss]
- (A2) $\forall t \forall t' \forall T \forall T' (T <_n T' \ \& \ t < t') \rightarrow$
 $\rightarrow \Box ((\mathbf{at-T}: (t < t' \ \& \ \mathbf{Present}(t)) \rightarrow \mathbf{at-T'}: \mathbf{Present}(t'))$ [premiss]
- (A3) $T1 < T2$
- (A4) $\mathbf{at-T1}: (t1 < t2 \ \& \ \mathbf{Present}(t1))$ [premiss]
- (A5) $\Box ((\mathbf{at-T1}: (t1 < t2 \ \& \ \mathbf{Present}(t1)) \rightarrow$
 $\mathbf{at-T2}: \mathbf{Present}(t2))$ [from A2]
- (A6) $N_{T1} ((t1 < t2 \ \& \ \mathbf{Present}(t2))$ [from A1, A4]
- (A7) $N_{T1} (\mathbf{at-T2}: \mathbf{Present}(t2))$ [from A5, A6 by Z1]
- (A8) $\forall t \forall t' \forall T \forall T' (T <_n T' \ \& \ t < t') \rightarrow \Box ((\mathbf{at-T}: \mathbf{Present}(t) \ \& \ N_T \mathbf{at-T'}: \mathbf{Present}(t')) \rightarrow N_t \mathbf{Obtains}(t'))$ [premiss]
- (A9) $N_t \mathbf{Obtains}(t2)$ [from A4, A7, A8]

In other words: Suppose that (i) $T2$ is the hyper-time that immediately follows $T1$, (ii) $t2$ is the hypo-time that immediately follows $t1$ and (iii) at $T1$ $t1$ is present. On the one hand we have that, necessarily, if $T2$ is the hyper-time that immediately follows $T1$, $t2$ is the hypo-time that immediately follows $t1$ and at $T1$ $t1$ is present, then at $T2$ $t2$ is present. On the other, we have that, since the state of the world at $T1$ is hyper-settled (the hyper-present is necessary), it is hyper-settled at $T1$ that $t1$ is present and $t2$ is the hypo-time that immediately

follows $t1$. Therefore, by (beta), we have that it is hyper-settled at $T1$ that $t2$ is present at $T2$ or, in other words, that the hyper-future of $T1$ is hyper-settled as to what hypo-time will be present at $T2$. However, if the hyper-future of the hyper-time at which $t1$ is present is hyper-settled, it follows that also the hypo-future of $t1$ is settled and, therefore, that is settled at $t1$ that $t2$ will obtain. Since the argument clearly generalises we cannot but conclude that, within what we might call the ‘hyper-temporal moving spotlight theory’ both the hyper-future and the hypo-future are settled. QED

The point made by means of the argument I have just exposed might be made more vivid as follows.

In the argument above I spoke, for simplicity’s sake, only of ‘(hypo-) times’ and ‘hyper-times’. However, within a branching framework we also have to distinguish between *times* and *moments*, where the latter are the nodes in the branching tree of possibilities and the former represent the ‘horizontal’ division of the branching tree as in the following figure (see chapter x on the times/moments distinction):

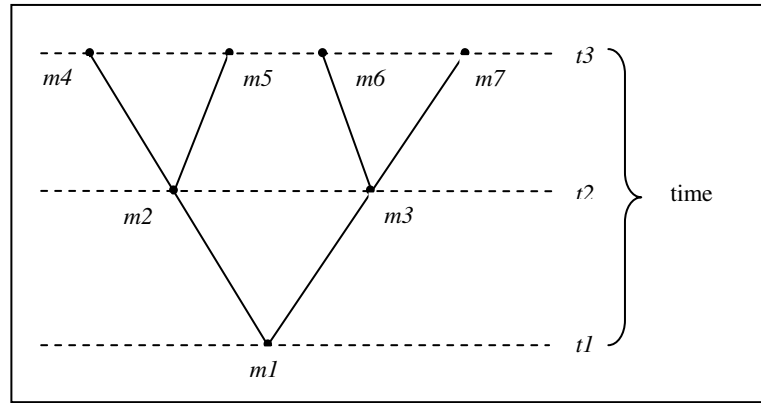


Figure 1

In light of the times/moments distinction the hyper-temporal moving spotlight framework we are considering must be reformulated as follows: there is one concrete history of concrete moments (the eternalist world block) and a concrete hyper-history of hyper-moments; moments and hyper-moments occur at times and hyper-times, respectively. Suppose that at a certain hyper-moment $M1$ the hypo-moment $m1$ is present and the hypo-moment $m2$ is the moment that immediately follows $m1$. Since (i) the hyper-present is hyper-settled, (ii)

necessarily, moments cannot cease to exist or come into existence nor they can change their order and (iii) necessarily, if at a hyper-moment M a moment m is present, then at the next hyper-moment M' the hypo-moment m' that immediately follows m will be present, it follows that—supposing that the hyper-moment $M1$ occurs at the hyper-time $T1$ —it is hyper-settled at $T1$ that the hyper-moment $M2$ will obtain and hence that $m2$ hyper-will be present. What this means is that there is no hyper-possible history passing through $M1$ such that $M2$ is not the hyper-moment that immediately follows $M1$. Since the result clearly generalises, we cannot but conclude that

- (31) Within a hyper-temporal moving spotlight framework, there can be only one *hyper*-history

which is tantamount to saying that, within a hyper-temporal moving spotlight framework, the hyper-future is hyper-settled.

On the other hand, we are also assuming that a necessary condition for the hypo-future to be hypo-unsettled is that the hyper-future be hyper-unsettled (thesis H3 above). Therefore, we cannot but conclude that

- (32) Within a hyper-temporal moving spotlight framework, there can be only one *hypo*-history

and, hence, that, within a hyper-temporal moving spotlight framework, the hypo-future is also settled.

For what concerns the principles used in my argument consider what follows:

- H1 is the principle stating the necessity of the hyper-present. We have seen above that the necessity of the present is one of the main assumptions in this essay. I provided above some considerations to bolster the plausibility of such claim. However, once the principle of the necessity of the present is accepted for the ordinary, first-order, temporal dimension, no principled reason appears forthcoming to reject it in the case of hyper-time. As a matter of fact, even when it comes to hyper-time what we should be

interested in is a robust, serious and objective form of hyper-openness of the hyper-future and as I have tried to argue—or at least to prove plausible—a serious notion of openness of the future requires the present to be necessary.

- H2 prohibits any kind of change in either the past, the present or the future within the process of temporal becoming. In other words, the only change we have in this MST-model is the movement of the moving spotlight. While the moving spotlight moves, in other words, everything else (moments and their ordering) cannot change.
- H4 is a crucial principle, which strikes nevertheless as highly-intuitive within a moving spotlight framework. If a certain set of events exists at a later moment, then those events will become present. Denying this point would just mean to threaten the intuitive meaning of the very idea of a moving spotlight of the present.
- H3 is, perhaps, the most controversial principle. I believe, however, that it has at least the ring of plausibility to it. As a matter of fact, one might deny H3 and say that what only is important in order for the hypo-future to be settled is that the hypo-future not be necessitated by the hypo-present state of the world and, hence, the fact that the hyper-future is settled should have no bearing at all on the openness of its hypo-temporal counterpart. This is an interesting objection that might be developed in an independently engaging theory for the open (hypo-)future within a moving spotlight theory. That said, I still think that the idea that the settledness of the hyper-future entails the settledness of the hypo-future is not one that can be easily rejected by moving-spotlight theorists either on pain of contradicting the very reasons that lead

them to embrace the moving spotlight theory, or on pain of being committed to a far too weak notion of the open future. As a matter of fact, MST-theorists posit the existence of the moving spotlight of the present to account for the objectively dynamic character of time. For MST-theorists, time literally passes, and in their theory the movement of the moving spotlight is what the objective passage of time consists in. On the other hand, the possible hypo-histories are intuitively thought of as representing the possible ways things might turn out to be...*in the future*. But such histories are like roads that the moving spotlight of the present might or might not take. Hence, to say that, although the present (hyper-) will move to moment m_2 by means of (hyper-)historical necessity, the (hypo-)future is nevertheless open would be like saying at a junction that there are many roads we can take, even if the car we are driving has no steering wheel and there is in fact no way for us to avoid taking the road ahead of us. It appears, in other words, that a necessary condition for an hypo-possible history to adequately represent a possible way the future might turn out to be is that it be possible for the moving spotlight to move from the moment which is now present down that history. However, since there is only one possible hypo-future capable of being illuminated by the moving spotlight, we cannot but conclude that there are no others hypo-possible futures.⁷

I conclude, therefore, that the argument for the settledness of the future in a hyper-temporal moving spotlight framework is sound.

So far, I have argued for the incompatibility between the moving spotlight theory and the open future by focussing on an eternalist hyper-time. However, as I have suggested above, there are at least other two options for the moving spotlight theorist to avoid the contradiction that seems to ensue by the position of a moving spotlight of the present, that is an A-theoretical hyper-time and the

⁷ This point will be made more vivid once the distinction between a ‘deep’ and ‘superficial’ past and future is introduced in chapter 3.

relativization of the movement of the moving spotlight to standard times. It is, however, easy to see that two similar kind of arguments can be advanced in both cases and, hence, that regardless of how the moving spotlight theorist decides to avoid the contradiction presented above, in a moving spotlight theory the future is necessarily settled.

The two arguments are the following:⁸

ARGUMENT B

The argument relies on the following transfer principle for hyper-settledness

(Z2) From $N_{\text{Now}}p$ and $\Box(p \rightarrow q)$, infer $N_{\text{Now}}q$

From ‘It is hyper-now settled that p ’ and ‘Necessarily, if p , then q ’, infer ‘It is hyper-now settled that q ’

If it is hyper-now the case that moment $m2$ is later than moment $m1$ and that moment $m1$ is present, then (by the principle of the necessity of the hyper-present) it is hyper-now settled that $m2$ is later than $m1$, and that $m2$ is present. It is, however, metaphysically necessary that if it is hyper-now the case that a moment m' is later than m and m is present, then it hyper-will be the case that m' is present. Hence—by the validity of the transfer principle Z2—it is hyper-now settled that it hyper-will be the case that $m2$ is present. Since, however, hyper-settledness entails hypo-settledness and—as we are assuming—the time of $m1$ is $t1$, it follows that it is settled at $t1$ that $m2$ will obtain.

ARGUMENT C

The argument relies on the following transfer principle for perspective settledness:

⁸ I will expose arguments B and C only informally. The overall structure of their formal counterparts should, however, be easily gathered from argument A.

(Z3) From $N_{at-t}p$ and $\Box(p \rightarrow q)$, infer $N_{at-t}q$

From ‘From the perspective of t , it is settled that p ’ and ‘Necessarily, if p , then q ’, infer ‘From the perspective of t , it is settled that q ’

If from the perspective of $t1$, $m1$ is present, $m1$ is earlier than $m2$ and $t1$ is earlier than $t2$, then from the perspective of $t1$ it is settled that $m1$ is present and $t1$ is earlier than $t2$. It is, however, metaphysically necessary that if from the perspective of t it is settled that, if $m2$ is later than $m1$, $m1$ is present and $t2$ is later than $t1$, then from the perspective of $t2$ it is the case that $m2$ is present. Hence—by the validity of the transfer principle Z3—it is settled, from the perspective of t , that from the perspective of $t2$ it is the case that $m2$ is present. Since, however, perspective-settledness entails simple settledness⁹ and—as we are assuming—the time of $m1$ is $t1$, it follows that it is (simply) settled at $t1$ that $m2$ will obtain.

I conclude, therefore, that no matter how the moving spotlight theorist decides to avoid the alleged contradiction that temporal passage seems to involve in her theory, the moving spotlight theory is incompatible with the open future. QED

2.6.3 Too many grounds for Branching Worlds?

In the previous sections I discussed the validity of the grounding principle with respect to three main metaphysical theories of time: eternalism, the growing-block theory and presentism. There are still two views on time I haven’t touched upon that deserve a brief comment as to their relationship to the grounding principle. Such theories are both *modal realist*, that is they both take possible histories to be concrete and equally existing lewisian worlds.

⁹ This point will be more clear once the distinction between deep and superficial future will have been exposed (see chapter 2).

The first one is both modal realist and dynamic and is usually called the *shrinking-tree theory*.¹⁰ According to the shrinking-tree theory, the concrete branching tree of Lewisian worlds composing the multiverse in an open future setting has a fundamental dynamic character that consists in the progressive ‘falling off’ of later and later branches. This process is what the objective and mind-independent temporal becoming consists in. The present, for shrinking-tree theorists, is *the* moment m on the branching tree such that there are no possible worlds to which m does not belong. In other words, the present is the moment m such that every possible world w includes a world-segment s representing one of its possible future.

The second theory is the one we might call *Lewisian branching-time theory*, which is a *static* theory of time: the branching-tree of historical possibility consists in a plurality of Lewisian worlds branching towards the future and overlapping towards the past, but no process of objective temporal becoming takes place. In a static Lewisian framework all the worlds exist *simpliciter* and no moment is marked as *the* present.

Unlike the no-futurist case, the problem with modal-realist theories of the open future is that there are *too many* grounds for future-directed propositions. As a matter of fact, assuming again for simplicity’s sake events to be what grounds the truth of propositions, if the following principle is taken as valid

- (BG) A future-directed proposition Fp saying that event e will obtain in the future is groundedly true(false), if, and only if there is a moment m' later than the present moment such that e obtain(does not obtain) at m'

it follows that for any moment m and future-contingent proposition Fp with respect to m , Fp is both groundedly true and groundedly false at m .

There appears to be no possible solutions to the modal realist *impasse*. The first consists in modifying (BG) as follows

- (BG1) A future-directed proposition Fp saying that event e will obtain in the future is groundedly true(false), if, and only if there is a *unique*

¹⁰ See McCall (1984, 1994).

moment m' later then the present moment such that e obtains(does not obtain) at m'

BG1 plus the principle that every true(false) proposition is groundedly true(false) entails that future-contingent statements are neither true nor false. However, we are here interested in the idea that future-contingent statement do possess a definite truth-value. As we will see, this idea entails that one of the possible futures of any moment m is such that it is marked as *the* way things will, in fact, turn out in the future of m . This idea appears to call for a reformulation of BG which might be reformulated as follows:

(BG2) A future-directed proposition Fp saying that event e will obtain in the future is groundedly true(false), if, and only if there is a moment m' later then the present moment *and lying on the 'true future' of the present moment* such that e obtain(does not obtain) at m'

However, also BG2 harbours a problem. As a matter of fact, given that all the possible futures of a certain moment are thought of as equally real, one might wonder *why* a certain future is *the* actual future. On the one hand, one might argue that the actual future is the future f along which all the true(false) future-directed statements are true(false) with respect to f . This, however, would engender a vicious circle to the effect that future-contingent statements are in fact ungrounded, at least given the validity of the following intuitively valid principle

(33) A true(false)proposition p cannot be grounded in a fact f , such that the fact that f obtains depends on p 's being true (false)

On the other hand, one might take there to be a *sui generis* objective property of 'being actual' which is possessed by a certain possible world w on the branching tree making rendering it the actual world in the branching multiverse. However, in this case it seems that an objection similar to the one posed to the moving spotlight theory could be mounted to the shrinking-tree theory of time. As a matter of fact, also shrinking-tree theorists admit that a

certain moment m is, in some sense, both present and non-present and, hence, are called to distinguish the temporal respects in which m is and is not present. But, under the plausible assumption that the property of ‘being actual’ cannot be lost or acquired in the process of objective temporal becoming, it appears that from the fact that (i) either *with respect to this hyper-moment* (ii) or *from the perspective of this moment*, (iii) or *it is hyper-now the case that* the moment m is present and the possible world w is actual we cannot but conclude—as we have done in the case of the moving spotlight theory—that the future is settled.

Things, however, do not look better for the static modal-realist: What in fact can the property of being actual amount to, once we have admitted that all worlds are ontologically on a par?

It seems, thus, that also in the case of modal realist theories we have a certain tension between with the principle of grounding and the principle of bivalence. For this reason—although I will sketch in chapter 8 a possible way for the static modal realist to respect the principle of grounding without jeopardizing neither the openness of the future nor the principle of bivalence—I will assume that also modal realist theorist of time have to option to reject the universal validity of the grounding principle and claim that future-contingent statement are ungrounded, even if truth-valued.

3 Conclusion

3.1 Summing-up

In this introductory part I have presented the framework within which I will be conducting my discussion about the principle of bivalence in the open future. Its most salient features can be summoned up in the following list:

- (i) the future is open in an objective, non-epistemic mind-independent way
- (ii) the future is open in a way the past is not

- (iii) the openness of the future is to be understood by means of a branching tree of (historically-)possible histories
- (iv) the present is historically necessary
- (v) determinism (properly understood) is incompatible with the idea that the future is open
- (vi) If future-contingent statements are truth-valued, their being truth-valued is not grounded on the present state of the world and, therefore, if they are grounded at all, their ground must lie in some other region of reality (if any).
- (vii) there are reasons to doubt the universal validity of the grounding principle and, hence, those theories of time which might be in tension with the idea that future-contingent statements are bivalent and presently ungrounded are to be considered a live option for the true-futurist
- (viii) the moving-spotlight theory is incompatible with the open future

3.2 Overview

In the next chapters, I will both defend the true-futurist idea that the principle of bivalence is unrestricted valid even if the future is open and present two logico-semantic theories within which True-Futurism can be accommodated. My discussion will proceed as follows:

PART ONE:

Open Future, Bivalence and Retrospective Determinacy

Chapter 2: Open future and relative truth

I will begin my discussion about the principle of bivalence in the open future by considering the idea, recently advanced by John MacFarlane, that a gappist approach to future-contingent statements requires a ‘truth-relativist’ framework, mainly for reason that have to do with our alleged intuitions about the behaviour of statements featuring ‘actually’.

MacFarlane’s rationale for a truth-relativist manoeuvre in the open future lies in the tension between what he calls the ‘indeterminacy’ and the ‘determinacy intuition’, namely the intuitions that (i) if the future is open an utterance of a future-contingent statement like ‘it will be sunny tomorrow’ is neither true nor false today but (ii) if yesterday I uttered ‘it will be sunny tomorrow’ and today is indeed a sunny day it is correct to say that my utterance was true.

The limited aim of this chapter is that of arguing that, even accepted the correctness of a gappist approach to the open future, truth-relativism proves to be unnecessary to accommodate our alleged intuitions. The main point against the relativist will concern the semantic behaviour of ‘actually’.

Chapter 3: Open Future and Bivalence

In chapter 3 I will propose a general positive argument for the validity of the principle of bivalence in the open future and defend it from possible objections. I will show that the main problem for Gappism is not much the tension between the determinacy and the indeterminacy intuition—as MacFarlane claims—but the tension between the determinacy intuition (or ‘the principle of

Retrospective Determinacy’ as I shall call it) and the *necessitation* of the main thesis of Gappism (that is, that future contingent statements are neither true nor false)

Chapter 4: Indeterminate truth and bivalence

I will discuss the idea, recently advanced by some authors, that future-contingent statements, although either true or false, are neither *determinately* true nor *determinately* false (‘Determinacy Gappism’). To this effect, I shall firstly argue that true-futurists are committed to what I shall call ‘Definite True-Futurism’, that is the view according to which future-contingent statements are either *definitely* true or *definitely* false. I will, therefore, conclude that the only option for determinacy gappists is that of taking their notion of indeterminate truth as referring to the grounding status of future-contingent statements by claiming either that future-contingent statements are ungrounded or indeterminately grounded.

PART TWO:

The True-Future of True-Futurism

Chapter 5: The logic of true futurism I—The problem of counterfactual evaluation

In chapter 5 I will begin the discussion of what is the true logico-semantic theory for True-Futurism. I will (i) address the ‘problem of counterfactual evaluation’ (as I shall call it), first presented by Nuel Belnap et al., (ii) present the distinction between *relative* and *absolute* ‘thin red line theories’ (where the ‘thin red line’ is the history marked as *the* way things will turn out to be), (iii)

advance two *prima facie* possible solutions to the problem of counterfactual evaluation and then (iv) dismiss them as wanting.

Furthermore, I will argue that the rather technical problem of counterfactual evaluation—concerning the truth-conditions of future-contingent statements with respect to moments that, in the branching tree of possibilities, lie off the thin red line—points in fact to a significant philosophical question, that is whether there are, in a bivalent open future setting, true *counterfactuals of openness* (COPs), that is counterfactuals like ‘if the merely counterfactual moment *m* had obtained, then the future-contingent statement *S* would have been true(/false)’.

Chapter 6: Against Counterfactual True-Futurism

This chapter will be devoted to arguing that the thesis that there are true counterfactuals of openness (‘Counterfactual True-Futurism’) contradicts the idea that the future is open and that, hence, true-futurists are committed to the view that, although, for every merely counterfactual moment *m* and future-contingent statement *S*, it is correct to say that *if m had obtained, then the S would have been either true or false*, it is both false to say that *if m had obtained, then S would have been true* and that *if m had obtained, then the S would have been false* (‘Factual True-Futurism’).

Chapter 7: The logic of true futurism II—The True Logic of True-Futurism

Drawing on the results obtained in the two previous chapters I will present two (factual) true-futurist theories meeting all the *desiderata* for an adequate true-futurist theory.

PART THREE:

True-Futurism and Metaphysics

Chapter 8: The metaphysics of the Thin Red Line

In this chapter I will show which metaphysical theories of time fit better with which true-futurist theories, briefly return to the problem of grounding for future-contingent statements and, finally, stress what is the main lesson to be drawn from my discussion for what concerns the topology of time and historical possibility.

Chapter 2

Open future and relative truth

In this chapter I will discuss John MacFarlane's recent claim that a gappist treatment of future-contingent statements requires a peculiar departure from the received Kaplanian semantics, consisting in the double relativization of the notion of sentence-truth to both a context of use (as Kaplan taught us) and a 'context of assessment'. What requires the gappist to choose a 'truth-relativist' framework, argues MacFarlane, is a *tension* between two equally strong intuitions about our assertions in the open future: the 'indeterminacy intuition' (according to which if the future is objectively unsettled and I utter 'it will be sunny tomorrow', then what I said is neither true nor false) and the 'determinacy intuition' (according to which if one day later it is indeed a sunny day, it is correct to claim that what I said yesterday was true).

In this chapter I shall be considering only whether MacFarlane's truth-relativism is indeed necessary in the open future, once Gappism is assumed and leave the question about whether Gappism is a viable option for open-futurists in the following chapter.

1 Open future, gappism and truth-relativism

1.1 Truth-relativism

According to a familiar picture, sentence-truth depends on two main factors: the *proposition* expressed by the sentence in question and the *circumstances* against which such proposition is evaluated. What proposition a certain sentence expresses might depend, for languages containing indexical

expressions, on the context in which that sentence is uttered or used. If, for instance, Barack Obama utters

(1) I am here now

in Washington on the 26th of May 2009, he will thereby express the proposition that Barack Obama is in Washington on the 26th of May 2009. But if Gordon Brown utters the same sentence in London on the 13th of December 2008, he will thereby express the proposition that Gordon Brown is in London on the 13th of December 2008. The context of use has thus in many cases a *content-determinative* role, as it helps determine which proposition is expressed by a certain sentence (as uttered in that context). According to the received view about sentence-truth, the context of use has also a *circumstances-determinative* role. Suppose that Obama has in fact uttered (1) in Washington on the 26th of May 2009. Knowing the context in which that sentence was uttered seem to suffice to determine whether his utterance is true: as a matter of fact, if Obama was actually in Washington on the 26th of May 2009, then since he uttered (1) in the actual world, his utterance was true. It seems thus that the relevant circumstances against which the proposition p expressed by a certain sentence S in a certain context c is to be evaluated are the very circumstances determined by c , so that the doubly relativized notion of sentence-truth at a context of use and circumstances of evaluation can be connected to the simpler notion of sentence-truth at a context of use as follows:

(2) A sentence S is true in the context c if, and only if, the proposition p expressed by S in c is true with respect to the circumstances determined by c

Since every utterance determines a unique sentence (the sentence uttered) and a unique context (the context in which the sentence was uttered)¹ the received view is that utterance-truth is *absolute*:

(3) An utterance u is true (*simpliciter*) if, and only if, S_u (the sentence uttered) is true in c_u (the context of utterance)

¹ See, however, Lopez De Sa (2008) for an interesting criticism to this point and to the idea that truth-relativism is best characterized by the claim that utterance-truth is relative.

Recently, the thesis that utterance-truth is absolute has been vigorously contrasted by many authors who, for many areas of discourse, have advocated the truth-relativist thesis that utterance-truth must be relativized to a *context of assessment*. The doubly relativized notion of utterance-truth is generally understood by relativists as defined by means of a doubly relativized notion of sentence-truth, as follows:

- (4) An utterance u is true with respect to the context of assessment c_a if, and only if, S_u (the sentence uttered) is true as uttered in c_u and assessed from c_a

Two main reasons might render sentence-truth relative also to a context of assessment:

- (a) *the context of use does not exhaust the content-determinative role:* which proposition a sentence expresses is determined (also) by the context from which the sentence is assessed
- (b) *the context of use does not exhaust the circumstances-determinative role:* the relevant circumstances (against which the proposition expressed by the sentence in question has to be evaluated) are determined (also) by the context from which the sentence is assessed.

In this paper, I will call the two different forms of truth-relativism corresponding to (a) and (b) *indexical-* and *nonindexical-*relativism, respectively (see §2.3 below).

1.2 Relative truth and the open future

Among other areas of discourse, the *open future* has been argued by John MacFarlane (2003, 2008) to require a truth-relativist framework. According to MacFarlane, there are two main intuitions elicited by an open future setting, which any theory of the open future should accommodate:

Suppose that the world is objectively indeterministic. In some possible futures, there is a sea battle tomorrow. In others, there is not. How should we evaluate an assertion (made now) of the sentence ‘There will be a sea battle tomorrow’? The question is difficult to answer because we are torn between two intuitions. On the one hand, there is a strong temptation to say that the assertion is neither true nor false. After all, there are possible future histories witnessing its truth and others witnessing its falsity, with nothing to break the symmetry. I shall call this ‘the indeterminacy intuition’. On the other hand, there is a strong temptation to say that the assertion does have a definite truth-value, albeit one that must remain unknown until the future ‘unfolds’. After all, once the sea battle has happened (or not), it seems quite strange to deny that the assertion was true (or false). I shall call the thought that the assertion does have a definite truth-value ‘the determinacy intuition’ (MacFarlane, 2003)

The supervaluationist theory of the open future^{2,3} appears to be one of the most promising theory within which the indeterminacy intuition can be properly articulated and accommodated. According to it, time is to be thought of as a tree of possible worlds overlapping towards the past and branching towards the future. Truth at a context must be consequently understood in terms of truth at every world overlapping at the context of utterance:

(5) S is true in the context c if, and only if, S is true at every point of evaluation⁴ $\langle c, w \rangle$, such that w is a world overlapping at c ;

S is false in the context c if, and only if, S is false at every point of evaluation $\langle c, w \rangle$, such that w is a world overlapping at c ;

² See Thomason (1970), Belnap et al. (2001), MacFarlane, MacFarlane (2003,2008).

³ ‘This is precisely the supervaluational idea: First you ascribe truth values dependent on an auxiliary parameter, and then you ascribe plain truth by using a universal quantifier to cancel the auxiliary parameter’ (Belnap, 2009). In our case the auxiliary parameter which gets ‘cancelled’ by a universal quantification is the possible-world parameter. Notice that, strictly speaking, the theories that I am calling in this paper ‘supervaluationism’ and ‘relativism’ are *both* supervaluationist theories. For simplicity’s sake, however, I use here ‘supervaluationism’ to refer to the supervaluationist theory which relativize truth only to a context of use.

⁴ A point of evaluation is a $\langle \text{context}, \text{index} \rangle$ pair, where a context is a possible occasion in which a sentence might be uttered or used (or a representation thereof), and an index is a n -tuple of parameters representing the circumstances against which the proposition expressed by the sentence in context has to be evaluated; see Kaplan (1989), Lewis (1996) and MacFarlane (2008). Here and throughout the paper I will be following MacFarlane (2008) in treating temporal modifiers as referring terms and quantifiers rather than operators, thus not taking an index to include also a time-parameter.

otherwise, S is neither true nor false in c .

Since only in some possible futures a sea battle is taking place tomorrow, the supervaluationist will predict my utterance of

(6) There will be a sea battle tomorrow

to be neither true nor false, thereby vindicating the indeterminacy intuition. Supervaluationism appears, however, to fall short of the determinacy intuition. According to (5), utterance-truth is in fact *absolute*: from any point of view, an utterance has a certain truth-value depending only on the worlds overlapping at the context of utterance. Therefore, for the supervaluationist my utterance of (6) is to be assessed as neither true nor false even from the advantaged point of view of today.

MacFarlane's (2003) solution to the supervaluationist *impasse* is surprisingly simple. Sentence-truth must be relativized both to a context of use and to a context of assessment, along the following lines:

(7) S is true in the context of use c_u and context of assessment c_a if, and only if, S is true at every point of evaluation $\langle c_u, w \rangle$, such that w is a world overlapping both at c and c_u ;

S is false in the context of use c_u and context of assessment c_a if, and only if, S is false at every point of evaluation $\langle c_u, w \rangle$, such that w is a world overlapping both at c_u and c_a ;

otherwise, S is neither true nor false in c_u/c_a .

The relativist's definition of utterance-truth given in (7) allows thus for a simple and elegant account of both the indeterminacy and the determinacy intuition (for simplicity's sake, the expression 'point of view' has to be understood—here and throughout the paper—as interchangeable with 'context of assessment'):

(i) From the point of view of yesterday, my utterance of (6) was neither true nor false, since only in some world overlapping both at the

context of utterance and of assessment (which in this case coincide) a sea battle is taking place today.

- (ii) From the point of view of today, my utterance of (6) was true, since in every world overlapping both at the context of utterance and of assessment a sea battle is taking place today.

1.3 Retrospective determinacy and propositions

More recently, however, MacFarlane (2008) has restricted his argument in favour of a relativist treatment of the open future, acknowledging that our intuitions about retrospective assessments are not based upon considerations about the technical notion of ‘utterance-truth’, but rather upon reflections about what has been said by our assertions—a *proposition*. Therefore, he now argues, the real question is whether supervaluationism can vindicate our retrospective assessments of the truth of propositions. The answer he gives is that, in most cases, the supervaluationist appears to be able to accommodate our intuitions.

According to MacFarlane (2008), in our ordinary retrospective assessments like ‘What I said yesterday was true’, ‘True’ occurs as a monadic predicate of propositions, whose semantics appears to be as simple and straightforward as

- (8) ‘True’ applies to x at a point of evaluation $\langle c, w \rangle$ if, and only if, x is a proposition and x is true at w .

Notice that (8) has two immediate consequences: (i) the absence of an argument place for a time in ‘true’ deprives its tensed uses of any semantic significance (the use of ‘was true’ instead of ‘is true’, for instance, is determined by grammatical reasons only); (ii) the following disquotational schema is true at every point of evaluation:

- (9) $\forall x((x = \text{the proposition that } S) \supset (\text{true}(x) \equiv S))$

It is easy to prove that in the case of (6) the supervaluationist can accommodate the determinacy intuition by saying that, if yesterday I uttered (6) and today a sea battle is indeed taking place, then what I said yesterday was true:

ARGUMENT A

(A1) Yesterday I uttered the sentence ‘There will be a sea battle tomorrow’ [premiss]

(A2) Yesterday I said that a sea battle would take place today [from (A1)]

(A3) A sea battle is taking place today [premiss]

(A4) What I said yesterday was true [from (A2),(A3),(9)]

Nevertheless, claims MacFarlane, this result still does not render the relativization to a context of assessment redundant, since the supervaluationist appears unable to deliver an adequate account of our retrospective assessments of claims made by means of sentences containing ‘actually’.

1.4 Truth and determinate truth

Before proceeding further, it might be interesting to appreciate the peculiar nature of the supervaluationist framework MacFarlane proposes in *Truth in the Garden of Forking Paths* for what concerns the Gappism/True-futurism debate.

The introduction of the truth-predicate defined in (8) in the object-language has the striking consequence of making True-Futurism *true* within it. As a matter of fact, it is an immediate consequence of (11) that, for every proposition p , it is true in every possible context of use c that

(10) True(p) or False(p)

Even if it is unsettled that p in c , it is thus incorrect to assert in c that p is neither true nor false. As MacFarlane himself says:

For those who do not think that a proof of unsettledness should compel withdrawal of an assertion about the future, this result might actually be welcome. From their

‘internal’ points of view on the branching tree of histories, speakers will not be able to acknowledge proofs of unsettledness as grounds for asserting that what they said was not true—since these proofs would then also be grounds for asserting the negations of what they said. (MacFarlane, 2008: 97)

However, he continues,

But for those supervaluationists who do think that a proof of unsettledness should compel withdrawal of an assertion about the future, there is an easy solution. We can introduce a ‘determinate truth’ predicate:

- (47) ‘DetTrue’ applies to x at a point of evaluation $\langle c, w \rangle$ if, and only if, x is a proposition and x is true at every world $w' \in W(c)$.

Using this predicate, our speakers can correctly characterize propositions whose truth is still unsettled as ‘not Determinately True’. Whether they take a proof of unsettledness to compel withdrawal of an assertion about the future will then depend on whether they think retraction is required by a proof that the assertion is not Determinately True. (MacFarlane, 2008: 97)

Notice that since—as the truth-predicate ‘True’—also ‘Determinately True’ is not time-indexed, it follows (by an argument parallel to argument A) that if yesterday I uttered ‘it will be sunny tomorrow’ and today is indeed a sunny day, then it is even correct to say today

- (11) What I said yesterday was determinately true

Notwithstanding the validity of the principle of bivalence in the object-language, and the correctness of retrospective assessments like (11), what we might call the *principle of determinate bivalence* is not valid within the object language. In other words, it is not the case that, for every proposition p and context c , it is true that

- (12) It is either determinately true that p or it is determinately false that p

This allows us to distinguish between two possible kinds of true-futurist theories, that is those that uphold the validity of (12) and those that reject it.

We might call the first *Determinacy True-Futurism* and the second *Indeterminacy True-Futurism*. It follows that MacFarlane's supervaluationist proposal is a gappist theory at the level of the meta-language, but an indeterminacy true-futurist theory at the level of the object-language.

The question whether Indeterminacy True-Futurism might be a viable option for true-futurists will be discussed in chapter 4. In the remainder part of this chapter I will be only concerned with the question whether, even accepted MacFarlane's rather unorthodox framework, truth-relativism is indeed required to accommodate our intuitions about actuality in the open future.

1.5 Relative truth and actuality

A plausible constraint on 'actually' is given by what MacFarlane dubs 'Initial Redundancy'

- (13) An operator \bullet is initial-redundant just in case for all sentences S , ' $\bullet S$ ' is true at exactly the same contexts of use (and assessment) as S (equivalently: each is a logical consequence of the other).

In standard (non-branching) frameworks, Initial Redundancy is granted by the fact that the actuality operator shifts the world of evaluation to the world of the context of utterance. The effect is that the proposition expressed by the sentence embedded by 'actually' is always evaluated with respect to the world of utterance:

- (14) 'Actually: S ' is true at the point of evaluation $\langle c, w \rangle$, if, and only if, S is true at $\langle c, w_c \rangle$, where w_c is the world of the context c .

In a branching framework, however, this definition will not do, since the openness of the future entails that there is no such thing as *the* world of the context of utterance. MacFarlane proposes thus the following definition for the actuality operator in a supervaluationist setting:

- (15) 'Actually: S ' is true at $\langle c, w \rangle$ if, and only if, S is true at every point of evaluation $\langle c, w' \rangle$, where w' is a world overlapping at c .

Here the actuality-operator behaves as a universal quantifier over the set of worlds overlapping at the context of use, thus respecting Initial Redundancy. To achieve the same result for the relativist, MacFarlane enriches the relativist's points of evaluation with a context-of-assessment parameter, thus defining the actuality operator as a universal quantifier over the set of worlds overlapping both at the context of use and at the context of assessment:

- (16) 'Actually:*S*' is true at $\langle c_u, c_a, w \rangle$ (where c_u is the context of use and c_a the context of assessment) if, and only if, *S* is true at every point of evaluation $\langle c_u, c_a, w' \rangle$, where w' is a world overlapping both at c_u and c_a .

Suppose then that yesterday, in the context c_1 , I uttered both

- (17) It will be sunny tomorrow

and

- (18) It will actually be sunny tomorrow

Suppose furthermore that today, in the context c_2 , it is in fact a sunny day. It is easy to see that the relativist will predict that, from the point of view of today's context of assessment, both (17) and (18) are true (as uttered in c_1). What about the supervaluationist? MacFarlane claims that

According to the supervaluationist, it should be correct for me to say [today] that my first claim was true and my second claim false (MacFarlane, 2008, p. 100).

Why? The only point which appears to bolster this statement is the following comment on the behaviour of the actuality operator in a non-branching framework:

No matter how deeply embedded we are, no matter how far the world of evaluation has been shifted, the actuality operator returns it to the world of the context of use (MacFarlane, 2008, p. 98).

Adapting this comment to our branching framework, what MacFarlane appears to claim is that when the supervaluationist evaluates today the proposition I expressed yesterday by my second claim, the very nature of the actuality operator makes it so that the relevant worlds for the truth of this proposition (today) are those overlapping at yesterday's context. For this reason, argues MacFarlane, the supervaluationist cannot but give the wrong predictions—today—about the truth of my second claim.

2. 'actually' as indexical

Assume the standard Kaplanian semantics for the supervaluationist and consider the following argument:⁵

ARGUMENT B

- (B1) Yesterday I uttered the sentence 'It will actually be sunny at t_2 '
[premiss]
- (B2) Yesterday I said that it would be actually sunny at t_2 [from (B1)]
- (B3) It is actually sunny at t_2 [premiss]
- (B4) What I said yesterday was true [from (B2),(B3) by (9)]

Suppose that (B1) and (B3) are true. If the argument were valid within the supervaluationist theory, it would follow that (B4) is true and, therefore, that the supervaluationist could—contrary to what MacFarlane claims—account for the determinacy intuition also when 'actually' is concerned. Therefore, if MacFarlane is right, B must be invalid for the supervaluationist. However, since MacFarlane is in fact assuming the validity of (9), the only passage he can blame for the alleged invalidity of B is the transition from (B1) to (B2). This, in turn, appears to entail that, according to MacFarlane, if (15) is the correct semantics for 'actually', the proposition expressed by 'It will actually

⁵ In the remainder of the paper, unless otherwise stated, I will use 'supervaluationist' to refer to the kaplanian (i.e. non truth-relativist) supervaluationist.

be sunny at t_2 ' at c_1 is different from the one expressed by 'It is actually sunny at t_2 ' at c_2 . Consider, in fact, the following argument:

ARGUMENT C

- (C1) By uttering 'It will actually be sunny at t_2 ', yesterday I expressed the proposition $P1$ [premiss]
- (C2) By uttering 'It is actually sunny at t_2 ' today, I am expressing the proposition $P2$ [premiss]
- (C3) It is actually sunny at t_2 [premiss]
- (C4) $P2$ is true [from (C2), (C3) by (9)]
- (C5) $P1=P2$ [premiss]
- (C5) What I said yesterday was true [from (C1),(C4),(C5) by (10)]

Argument C strikes as valid. But the only premiss MacFarlane could reject as false appears to be (C5), that is the premiss according which 'It will actually be sunny at t_2 ' at c_1 and 'It is actually sunny at t_2 ' at c_2 express the very same proposition. For MacFarlane, it must, therefore, be for this very reason that the transition from (B1) to (B2) is invalid: since yesterday (by uttering 'It will actually be sunny at t_2 ') I expressed $P1$ and $P1$ is different from $P2$ (the proposition that 'It is actually sunny at t_2 ' expresses today), I *cannot* report *today* what I said yesterday by saying that yesterday I said *that it would actually be sunny at t_2* , because this would be tantamount to saying that yesterday I expressed $P2$, contrary to what we are assuming.

On the other hand, what only could be blamed for the difference in the proposition expressed by the two sentences in c_1 and c_2 , respectively, appears to be 'actually'. In other words: in the framework we are considering, only if the semantic value of 'actually' can vary from context to context, the sentences 'It will actually be sunny at t_2 ' and 'It is actually sunny at t_2 ' can express two

different propositions in c_1 and c_2 , respectively.⁶ It seems, therefore, that C and B are unsound only if ‘actually’ is an *indexical* expression, that is an expression whose semantic value is a function of the context in which it is uttered (such as, for instance, ‘I’ and ‘here’).

It is, therefore, possible to reconstruct MacFarlane’s implicit argument against the supervaluationist as follows:

ARGUMENT D

- (D1) ‘actually’ is initial-redundant [premiss]
- (D2) The initial redundancy of ‘actually’ is respected only if ‘actually’ is defined as returning—*somehow*—the world of evaluation to the worlds overlapping at the context of utterance [premiss]
- (D3) ‘actually’ is an operator behaving always as an universal quantifier over the worlds overlapping at the context of utterance [from (D2)]
- (D4) (15) is the correct semantics for ‘actually’ [from (D3)]
- (D5) ‘actually’ is indexical [from (D4)]
- (D6) If ‘actually’ is indexical, then argument B is invalid and, hence, the supervaluationist cannot vindicate the determinacy intuition when actuality-sentences are concerned [premiss]
- (D7) The supervaluationist cannot vindicate the determinacy intuition when actuality-sentences are concerned [from D5,D6]

I will not dispute here neither that (D5) follows from (D4) nor the truth of (D1), (D2) and (D6).⁷ Furthermore, for the time being, I will also assume the truth of (D3). The crucial point is, therefore, whether (D4) follows from (D3),

⁶ In fact, within the framework under discussion, ‘It will be sunny at t_2 ’ in c_1 is thought of as expressing the same proposition as ‘It is sunny at t_2 ’ in c_2 . In other words, the supervaluationist endorses an *eternalist* position on propositional truth (see section 3). On this point, see also MacFarlane (2008).

⁷ See, however, Heck (2006) and Brogaard (2008) on some criticism to (D6).

that is whether (15) is the only possible semantics for ‘actually’, if we define ‘actually’ as an operator behaving always as an universal quantifier over the worlds overlapping at the context of utterance.

The answer, as I shall argue, must be negative.

3. Context-sensitivity: indexical/nonindexical

Interestingly enough, it is MacFarlane himself that provides us with the proper theoretical tools to contrast his claims about the puzzle of retrospective determinacy. As a matter of fact, in his ‘Nonindexical Contextualism’ (2009) he disentangles two notions that appear to have always been conflated in the literature on contextualism: *indexicality* and *context-sensitivity*. This leads him to acknowledge two different kinds of context-sensitivity: *indexical* and *nonindexical*. To understand MacFarlane’s point, consider the following argument (for an arbitrary sentence *S*, contexts *Cx* and *Cy* and feature *g* of the context):

ARGUMENT E

- (E1) The truth value of *S* as uttered in an arbitrary context *c* depends on the feature *g* of *c*
- (E2) contexts *Cx* and *Cy* differ relevantly with respect to the feature *g*
- (E3) *S* is true in *Cx* and false in *Cy*
- (E4) *Therefore, S* expresses different propositions in *Cx* and *Cy*
- (E5) (*and hence*) the *g*-difference between *Cx* and *Cy* is—somehow—reflected in the difference between the propositions *Px* and *Py* (which are the propositions expressed by *S* in, respectively, *Cx* and *Cy*)

Argument E has some initial plausibility. Take for instance the sentence:

- (19) I am British

The truth value of (19) depends clearly on the *speaker* of the context. Consider in fact two contexts in which the speaker is relevantly different, such as the contexts in which (19) is uttered by Gordon Brown and Barack Obama, respectively. (19) is true as uttered by Brown and false as uttered by Obama. This appears to depend on the fact that Brown and Obama have expressed two different propositions, that is the propositions that Gordon Brown is British and that Barack Obama is British.

However, as MacFarlane efficaciously argues, argument E harbours a fallacy. Consider, for example, the following instance of E:

ARGUMENT F

- (F1) The truth value of ‘Socrates is sitting’ as uttered in an arbitrary context c depends on the time of c
- (F2) the time of context c_1 is different from the time of context c_2
- (F3) S is true in c_1 and false in c_2
- (F4) *Therefore*, S expresses different propositions in c_1 and c_2

To understand what is wrong with argument F, MacFarlane⁸ asks us to consider the contemporary debate on the semantics of tense. The main point under dispute is whether or not propositions can change their truth value over time. *Eternalists* (as our supervaluationists) deny this: they claim that a tensed sentence like ‘Socrates is sitting’ uttered in a context c expresses the proposition that Socrates is sitting at t_c (where t_c is the time of c), whose truth value is not time-dependent, but depends only on the world against which it is evaluated; *temporalists*, instead, claim that ‘Socrates is sitting’ expresses always the proposition that Socrates is sitting, whose truth value depends (also) on the time against which it is evaluated. Therefore, although temporalists accept that tense is context-sensitive, they deny its being indexical, thus rejecting argument F.

⁸ See MacFarlane (2009: 233-234).

Whereas eternalists think propositional truth to be relative only to possible worlds, for temporalists it is relative to both a possible world *and* a time. In other words: whereas eternalists think that the circumstances of evaluation against which propositions are evaluated are simply possible worlds, temporalists claim instead that they have to be represented by <world,time> pairs.⁹ Therefore, what makes tense *context*-sensitive is for temporalists both the fact that (i) the truth of tensed sentences like ‘Socrates is sitting’ depends (also) on a time-parameter *t* and the fact that (ii) *t* (along with the world-parameter) is ‘initialized’ by the context of utterance, so that the truth value of a tensed sentence like ‘Socrates is sitting’ with respect to any context *c*, depends in fact (also) on the time *of the context c*.

According to MacFarlane’s lesson, there are thus in general *two* ways in which a certain expression *e* might be sensitive to a certain feature *g* of the context of utterance:

- (i) The proposition expressed by a sentence *S* containing *e* depends on the feature *g* of the context
- (ii) Although the proposition expressed by a sentence *S* containing *e* does not depend on the feature *g* of the context, (i) *g* is part of the circumstances of evaluation (that is: the *n*-tuple of parameters representing the circumstances of evaluation comprises a *g*-parameter) and (ii) the relevant *g* is the *g* of the context (the *g*-parameter is ‘initialized’ by the context of utterance).

Although in both cases *e* is context-sensitive, in the first case, *e* is an *indexical* expression; in the second case, *e* is a *nonindexical* expression.

4. ‘actually’ as nonindexical

With the indexical/nonindexical distinction in play, it is easy to show that argument D is not valid. The fact that ‘actually’ is an operator behaving as an universal quantifier over the worlds overlapping at the context of utterance

⁹ See, for instance, Kaplan (1989).

means that ‘actually’ is a *context-sensitive* operator. However, as we have just seen, the fact that ‘actually’ is context-sensitive does not entail that it is an indexical expression, since the feature *g* of the context ‘actually’ is sensitive to might in fact only be part of the circumstances of evaluation, without affecting the proposition expressed by actuality-sentences.

It is relatively easy to give a *nonindexical* semantics for ‘actually’ which meets our *desiderata*:

I. First, we enrich our indices (that is the n-tuples $\langle x, y, z, \dots \rangle$ representing the circumstances of evaluation) with a *set-of-worlds* parameter s , (henceforth: the ‘actuality parameter’) and take, consequently, a point of evaluation to be a $\langle \text{context}, \text{world}, \text{set of worlds} \rangle$ triple.¹⁰

II. Second, we define the actuality operator as follows:

- (20) ‘actually: S ’ is true at a point of evaluation $\langle c, w, s \rangle$ (where c is a context, w is a world and s is a set of worlds) if, and only if, S is true at every point of evaluation $\langle c, w', s \rangle$, where w' is a world belonging to s .

III. Finally, we substitute the definition of sentence-truth at a context given in (5) with

- (21) S is true at a context c if, and only if, S is true at every point of evaluation $\langle c, w, s_c \rangle$, such that w is a world overlapping at c and s_c is the set of worlds overlapping at c ;

S is false at the context c if, and only if, S is false at every point of evaluation $\langle c, w, s_c \rangle$, such that w is a world overlapping at c and s_c is the set of worlds overlapping at c ;

otherwise, S is neither true nor false at c .

¹⁰ Notice that taking points of evaluation to be $\langle \text{context}, \text{world}, \text{set of worlds} \rangle$ triples is tantamount to taking circumstances of evaluation not to be simply possible worlds—as previously done—but $\langle \text{world}, \text{set of worlds} \rangle$ pairs, instead.

Within this theory, three facts assure that ‘actually’ behaves always as a universal quantifier over the set of worlds overlapping at the context of utterance, thus respecting (D3) and Initial Redundancy:

- (a) by (20), the truth-conditions for ‘actually’ involve a universal quantification over the set of worlds represented by the actuality parameter;
- (b) by (21), the actuality parameter is initialized by the context of utterance as the set of worlds overlapping at the context of utterance;
- (c) in the absence of an operator capable of shifting the actuality-parameter,¹¹ once initialized by the context of utterance, it retains the same value (that is, the set of worlds overlapping at the context of utterance) ‘no matter how far the world of evaluation has been shifted’.

The actuality operator so defined is clearly nonindexical. As a matter of fact, although in this case ‘actually’ is indeed sensitive to the set of worlds overlapping at the context of utterance, such a feature of the context is simply part of the circumstances of evaluation and, thus, does *not* affect the proposition expressed by an actuality-sentence. However, if ‘actually’ is nonindexical, then arguments B and C are sound. The nonindexicality of ‘actually’ entails, in fact, that ‘It will be actually be sunny at t_2 ’ at c_1 and ‘It is actually sunny at t_2 ’ at c_2 express the very same proposition, to the effect that both the transition from (B2) and (B3) to (B4) is valid and that premiss (C5) is true.¹² But if B and C are sound, then the supervaluationist has no trouble at all with the determinacy intuition, contrary to what MacFarlane claims.

¹¹ Stanley (2005) has recently attacked—drawing on Lewis (1980)—the position according to which some elements of the circumstances cannot be shifted by any sentence operator. For a plausible defence from this objection see MacFarlane (2009: 245).

¹² Notice that ‘true’ has, in this case, to be redefined as follows:

- (8’) ‘True’ applies to x at a point of evaluation $\langle c, w, s \rangle$ if, and only if, x is a proposition and x is true with respect to the circumstances of evaluation $\langle w, s \rangle$

5. Is ‘actually’ nonindexical?

So far I have (i) argued that MacFarlane’s argument E is invalid, (ii) proposed a nonindexical semantics for ‘actually’ and (iii) shown that if ‘actually’ is nonindexical, then the puzzle of retrospective determinacy poses no threat to the supervaluationist theory. The real question is, therefore, whether there are good reasons to think that (at least in a branching setting) ‘actually’ is indeed a nonindexical expression. In this section I will present a simple consideration that—at least *prima facie*—appears to bolster this idea.

Within a branching framework, if I utter today

(22) There will be a sea battle tomorrow

my utterance is neither true nor false because there is no possible future marked as ‘special’, among all the futures branching from the present context. The supervaluationist theory rightly predicts so. Suppose, however, that I utter today

(23) There will *actually* be a sea battle tomorrow

According to the definitions given by MacFarlane both for the Kaplanian and the relativist supervaluationist ((15) and (16) above), my utterance is *false* (from the context of assessment of today), since it is false that in *every* possible future there is a sea battle tomorrow. Moreover, given (5), all the sentences of the form ‘actually:*S*’ are *bivalent* (with respect to any context *c*). However, the reason why (22) is deemed to be gappy in a branching setting is that no possible future is marked as *the* way things will turned out to be. But this seems to be just tantamount to saying that no future is marked as the *actual* one, since every possible future is a good candidate for the way things will

Hence, if I say today (in the sunny context c_2) ‘What you have said yesterday was true’ referring to the proposition P1 I expressed yesterday by uttering ‘It will actually be sunny at t_2 ’ my utterance is *true*, since for every pair $\langle w, s_2 \rangle$, such that w belongs to s_2 and s_2 is the set of worlds overlapping at c_2 , the proposition P1 *that it is actually sunny at t_2* is true. [Notice that both (8) and (8’) are instances of

(8”) ‘True’ applies to x at a point of evaluation $\langle c, e \rangle$ if, and only if, x is a proposition and x is true with respect to the circumstances of evaluation e]

actually turn out to be. It seems thus that, in a branching setting, not only (23) should get the same truth value as (22), but also that, in general, actuality-sentences of the form ‘actually:S’ should be neither true nor false at all (and only) the contexts in which S is neither true nor false. In other words, it appears that ‘actually’ should be constrained not only by the principle of Initial Redundancy, but also by the principle—that we might dub *Initial Equivalence*—according to which:

- (24) An operator \bullet is *initial-equivalent* just in case for all sentences S and contexts c , S is true/false/neither at a context c if, and only if, ‘ \bullet S’ is true/false/neither at c .

There is a simple *nonindexical* definition of ‘actually’ that can be added to the supervaluationist theory to meet Initial Equivalence and make (23) neither true nor false. It is sufficient to reformulate (20) and (21) above taking the actuality-parameter to be simply a possible world (instead of a set of worlds), as follows:

- (25) ‘actually:S’ is true at $\langle c, w, w' \rangle$ (where c is a context and w [the world of evaluation] and w' [the actuality-parameter] are possible worlds) if, and only if, S is true at the point of evaluation $\langle c, w', w' \rangle$

- (26) S is true at a context c if, and only if, S is true at every point of evaluation $\langle c, w, w \rangle$, such that w is a world overlapping at c ;

S is false at a context c if, and only if, S is false at every point of evaluation $\langle c, w, w \rangle$, such that w is a world overlapping at c ;

otherwise, S is neither true nor false at c .

According to (25), ‘actually’ shifts the world of evaluation back to the ‘actual world’ represented by the actuality-parameter; according to (26), the ‘actual world’ and the world of evaluation are initialized by the context of utterance as one of the worlds overlapping at the context. It is straightforward to see that it is a consequence of (25) and (26) that:

- (27) S is true/false/neither at a context c if, and only if, ‘actually: S ’ is true/false/neither at c .

and that, therefore, ‘actually’ is not only initial-redundant but also initial-equivalent.

As the actuality operator defined in (20), also the operator defined in (25) is clearly nonindexical. It seems, on the other hand, that no indexical account of ‘actually’ can be added to the supervaluationist theory to meet Initial Equivalence. The argument goes as follows:

ARGUMENT G

- (G1) ‘actually’ is (somehow) sensitive to the world(s) overlapping at the context of utterance [premiss]
- (G2) Within the supervaluationist theory, ‘actually’ is to be defined by means of the notion of truth-at-a-point-of-evaluation [from the definition of supervaluationism]
- (G3) The notion of truth-at-a-point-of-evaluation is bivalent [from the definition of supervaluationism]
- (G4) What only a context can provide for the semantics of ‘actually’ in terms of possible worlds within a supervaluationist setting is a *set* of worlds (that is, the set of worlds overlapping at the context) [from the definition of branching time]
- (G5) If ‘actually’ is indexical, the truth value of ‘actually: S ’ at a certain point of evaluation $\langle c, w \rangle$ depends on the context parameter c [from the definition of indexicality]
- (G6) If ‘actually’ is indexical, the truth value of ‘actually: S ’ at a certain point of evaluation $\langle c, w \rangle$ depends on the set of worlds overlapping at c [from G4, G5]

- (G7) If ‘actually’ is indexical, then ‘actually:S’ is true at a point of evaluation $\langle c, w \rangle$ if the set of worlds overlapping at c is *such-and-such*; otherwise ‘actually:S’ is false at $\langle c, w \rangle$ [from G1, G2, G3, G6]
- (G8) If ‘actually’ is indexical, then ‘actually:S’ is true at a context c if the set of worlds overlapping at c is *such-and-such*; otherwise ‘actually:S’ is false at c [from G7, (2)]
- (G9) If ‘actually’ is indexical, then for every sentence S and context c , ‘actually:S’ is either true or false at c [from G8]
- (G10) For some sentence S and context c , S is neither true nor false at c [premiss]
- (G11) ‘actually’ is initial-equivalent only if, for some sentence S and context c , ‘actually:S’ is neither true nor false at c [from the definition of Initial Equivalence, G10]
- (G11) If ‘actually’ is indexical, it is not initial-equivalent [from G11]

G is valid; (G1) is intuitively true; (G2)-(G4) cannot be denied without giving up either branching time or supervaluationism; (G5) appears to encapsulate the very gist of the notion of indexicality; denying (G10) would be for the supervaluationist tantamount to rejecting the very idea that the future is open. Therefore, we have to conclude that, if the supervaluationist accepts the correctness of Initial Equivalence as a constraint on ‘actually’, she is committed to a nonindexical account of ‘actually’ as, for instance, the one given in (25).

6. Conclusion

The puzzle of retrospective determinacy might appear to require the supervaluationist to embrace truth-relativism and consequently depart from the standard Kaplanian semantics. To the contrary, I have argued in this paper both that (i) if ‘actually’ is nonindexical, then the supervaluationist can easily accommodate our intuitions about retrospective assessments without going

relativistic and that (ii) the supervaluationist appears to have good reasons to endorse a nonindexical treatment of the actuality operator.¹³ I conclude, therefore, that even accepting MacFarlane claims about the indeterminacy intuition and his rather unorthodox supervaluationist framework, truth-relativism is not necessary in the open future.

¹³ An interesting question arising from my discussion is whether, contrary to the received view on the matter, ‘actually’ is a nonindexical operator even in standard, *non*-branching, settings and, consequently, whether (25) might be seen as the correct *universal* definition of the actuality operator. Given the limited purpose of this chapter, I must leave this issue for another occasion.

Chapter 3

Open Future and Bivalence.

1. Introduction

Suppose that the future is open in some objective and metaphysically robust sense and, hence, that for some future-directed proposition ' Fp ' (where ' F ' is the future-tense operator 'it will be the case that' and p is a present-tense proposition like 'It is raining in London') it is presently unsettled whether it is the case that Fp (in what follows ' N ' stands for 'it is now settled that'):

$$(1) \quad \sim NFp \ \& \ \sim N\sim Fp$$

Let us call the *truth-status* of a certain proposition p its being either *truth-valued* (i.e. either true or false) or *gappy* (i.e. neither true nor false). The question I aim to discuss in this chapter is the following:

What is the truth-status of future-contingent propositions?

This question gives rise to two distinct philosophical positions, which I shall call 'Gappism' and 'True-Futurism', respectively:

Gappism: Future-contingent statements are neither true nor false

True-Futurism: Future-contingent statements are either true or false

The aim of this chapter is to put forward a positive argument for True-Futurism. Its core features a general principle, that I shall call the principle of 'retrospective determinacy':

Retrospective Determinacy: if it is the case that p , then it was true that p
would be the case

As seen in chapter 2, John MacFarlane (2003, 2008) has recently argued that the ‘intuition’ behind the principle of retrospective determinacy (the ‘determinacy intuition’) is in tension with another intuition central to gappism, according to which if it is now unsettled today whether it will be raining in London tomorrow then it is neither true nor false that it will be raining in London tomorrow (the ‘indeterminacy intuition’). How can it be, in fact, that today it is neither true nor false that p and, once a day has elapsed, it is true to say that p was true? To solve this puzzle MacFarlane has claimed that gappists should employ a truth-relativist framework according to which sentence-truth is not only relative to a context of utterance (as in the standard Kaplanian framework) but also to a ‘context of assessment’, that is the context from which the truth-value of a certain statement or utterance is assessed.

I agree with MacFarlane that the principle of retrospective determinacy is problematic for gappists. However, in what follows, I will argue that the real tension is not between Retrospective Determinacy and the Indeterminacy Intuition, but between Retrospective Determinacy and the *necessitation* of the main gappist claim about the truth-status of future-contingents. The gist of my argument is the following: gappists claim that future-contingent statements are *as such* gappy. This appears to be tantamount to claiming that, *necessarily*, if Fp (‘It will be the case that p ’) is unsettled then it is neither true nor false. However, if the principle of retrospective determinacy is valid, there are future-directed statements Fp for which it is both true to say that Fp was true and that it was unsettled. But if Fp was both true and unsettled then it is false that *necessarily* if a statement Fp is unsettled then it is gappy. However, if future-contingent statements have a certain truth-status S (truth-valued/gappy), then they must have such a truth-status by necessity, that is: either they are necessarily truth-valued or necessarily gappy. Therefore, since they are not necessarily gappy they are necessarily truth-valued and, hence, True-Futurism is true.

In the following, I will expose in detail the argument for the principle of bivalence in the open future and review some possible objections to it. I will show how the two main possible strategies available to gappists are both untenable and conclude that, therefore, True-Futurism is the correct answer to the question about the truth-status of future-contingent statements.

2. An argument for bivalence in the open future

Consider the following two principles:

- (P1) Either it is necessary that future-contingent statements are either true or false or it is necessary that future-contingent statements are neither true nor false

$$\Box[(\sim NFp \ \& \ \sim N\sim Fp) \rightarrow (TFp \vee FFp)] \vee \Box[(\sim NFp \ \& \ \sim N\sim Fp) \rightarrow (\sim TFp \vee \sim FFp)]$$

- (P2) If it is the case that p , then it was true that it would be the case that p
 $p \rightarrow PTFp$

(P1) states that future-contingent statements have a certain truth-status S by necessity. Within the Gappism/True-Futurism controversy, such a principle is surely valid. Both contenders claim, in fact, something about future-contingent statements *as such*. Therefore, they must perforce claim that their thesis has at least a certain form of necessity. How could it be, in fact, that future-contingent statements have a certain truth-status S only contingently? How could it be that, say, future-contingent statements are actually gappy but, had things gone otherwise, they would have been truth-valued? What would settle their truth-status in this case? It appears, thus, that *any* philosophically stable and credible position about the truth-status of future-contingent statements has to be put in the form of a necessity-claim.

On the other hand, (P2) strikes as a highly-intuitively valid principle governing the way we talk about past assertions about the future. Often, in fact,

we find ourselves saying things like ‘You were right’ or ‘What she said was true’ referring to things people have said in the past about the future. The very practice of betting appears to be based on the principle of retrospective determinacy: ‘I’ll pay you 100\$, if it turns out that what you are now saying is true’; ‘Yesterday you bet on Crazy Horse, saying that it would win the race. You guessed right. Here is your money!’.

However, P1 and P2 can be used to argue that, necessarily, future-contingent statements are either true or false and, therefore, (at least as far future-contingent statements are concerned) the principle of bivalence is valid even if the future is open. The argument is the following:

ARGUMENT A

- | | | |
|------|---|-----------------|
| (A1) | p | [premiss] |
| (A2) | $P(\sim NFp \ \& \ \sim N\sim Fp)$ | [premiss] |
| (A3) | $P\mathbf{T}Fp$ | [from A1 by P2] |
| (A4) | $P(\sim NFp \ \& \ \sim N\sim Fp \ \& \ \mathbf{T}Fp)$ | [from A2, A3] |
| (A5) | $\sim \Box[(\sim NFp \ \& \ \sim N\sim Fp) \rightarrow (\sim \mathbf{T}Fp \vee \sim \mathbf{F}Fp)]$ | [from A4] |
| (A6) | $\Box[(\sim NFp \ \& \ \sim N\sim Fp) \rightarrow (\mathbf{T}Fp \vee \mathbf{F}Fp)]$ | [from A5 by P1] |

If today it is the case that p , then it was true yesterday that p would be the case today. But it was unsettled yesterday whether it would have been the case that p today. Therefore, yesterday the proposition that today it would have been the case that p was both unsettled and true. It is thus false that, necessarily, future-contingent statements are neither true nor false. Therefore, since future-contingent statements have a certain truth-status necessarily, it follows that, necessarily, future-contingent statements are either true or false.

3. Rejecting P1: deep and superficial past

The first way to resist A's conclusion is to deny P1. The simple denial of P1, however, appears insufficient to achieve a plausible philosophical position about the truth-status of future-contingent statements: what can it mean, in fact, that future-contingent statements are sometimes truth-valued and sometimes gappy? What could determine, on each occasion, their truth-status? Gappists, however, appear to have a *prima facie* plausible story to tell about P1 instead of simply rejecting it. It is true, they can say, that yesterday *Fp* was true. But this is only how things are from the perspective of the present moment (or, alternatively, considering yesterday simply as a moment *that is now past*, keeping fixed the way things have turned out to be today). Instead, from the perspective of yesterday (alternatively: considering yesterday *as it was* when it was present) *Fp* was indeed neither true nor false. Gappists can in other words distinguish between *two* ways to look at a (either merely possible or actual) moment *m* in time: from the perspective of an arbitrary moment *m'* or from the perspective of *m* itself. This distinction, in turn, gives rise to two kinds of necessity, that we might call 'absolute' and 'diagonal', respectively:

(N1) *p* is *absolutely necessary* if and only if, for every possible moment *m*, *p* is true at *m* from the perspective of every time *m'*

(N2) *p* is *diagonally necessary* if, and only if, for every possible moment *m*, *p* is true at *m* from the perspective of *m* itself

For (what we can call) the *refined gappist*, N2 is the sense in which it is true that, *necessarily*, future-contingent statements are neither true nor false, that is: future-contingent statements can be *retrospectively* truth-valued, but *present* future-contingent statements *are* always (and by d-necessity) gappy.

In light of the distinction between N1 and N2, P2 becomes ambiguous, since the necessity operator '□' featuring in it can be interpreted as referring to either a-necessity or d-necessity. If we interpret P1 as a-necessity, it is false. If we interpret P1 as d-necessity, it is true, but the resulting argument—which we

might call ‘argument A’ (where ‘■’ stands for ‘it is d-necessary that’) — becomes invalid:

ARGUMENT A’

- | | | |
|-------|---|------------------|
| (A’1) | p | [premiss] |
| (A’2) | $P(\sim NFp \ \& \ \sim N\sim Fp)$ | [premiss] |
| (A’3) | $P\mathbf{T}Fp$ | [from A’1 by P2] |
| (A’4) | $P(\sim NFp \ \& \ \sim N\sim Fp \ \& \ \mathbf{T}Fp)$ | [from A’2, A’3] |
| (A’5) | $\sim \blacksquare[(\sim NFp \ \& \ \sim N\sim Fp) \rightarrow (\sim \mathbf{T}Fp \vee \sim \mathbf{F}Fp)]$ | [from A’4] |
| (A6) | $\blacksquare[(\sim NFp \ \& \ \sim N\sim Fp) \rightarrow (\mathbf{T}Fp \vee \mathbf{F}Fp)]$ | [from A’5 by P1] |

In this case, the invalidity of A’ can depend on two factors, depending on how we interpret the past-tense operator ‘*P*’ in (A’4). As a matter of fact, the distinction between a- and d-necessity goes along with the distinction between what we may call a ‘superficial’ and ‘deep’ past, that is the past *as it is now* and the past *as it was* when it was present. If ‘*P*’ in (A’4) is intended in the superficial sense, then (A’4) is true but then the passage from (A’4) to (A’5) is invalid, since, from the point of view of today, it was true yesterday that *Fp* was true, does not entail that when yesterday was present *Fp* was true and therefore, that it is not d-necessary, that if *Fp* is unsettled it is gappy. If (A’4) is intended in the deep sense, then it is false, since from the point of view of yesterday, *Fp* was neither true nor false.

4. Retrospective determinacy: deep and superficial future

It seems thus that gappists can resist argument A’s conclusion by rejecting P1. To reject P1 (and to preserve a certain modal strength for their main claim) they have to distinguish between two kinds of necessity. This distinction goes

along with the distinction between two ways to consider the past: the *past as it is* (superficial past) and the *past as it was* (deep past). Let us introduce the two past-tense operators ‘was:’ and ‘WAS:’ to refer to the superficial and the deep past, respectively. According to the refined gappist, although it is true that in the superficial past Fp was true

$$(2) \quad \text{was:TF}p$$

in the deep past Fp was neither true nor false

$$(3) \quad \text{WAS:}(\sim\text{TF}p \ \& \ \sim\text{FF}p)$$

However, a problem appears to lurk. As a matter of fact, the a-/d-necessity distinction does not go along only with the superficial/deep past distinction but also with the distinction of a superficial and deep *future*, that is: the future as it *is* and the future as it *will be*. It appears, in other words, that if we can talk about the past as it is and the past as it was, we can also distinguish between the future *as it is now* and the future *as it will be*, when the relevant amount of time will have elapsed. Let us, then, also introduce the two future-tense operators ‘will:’ and ‘WILL:’ to refer to the superficial and the deep future, respectively. The distinction between deep and superficial past and future allows thus for the following disambiguations of P2:

$$(P2a) \quad p \rightarrow \text{was:TWILL:}p$$

$$(P2b) \quad p \rightarrow \text{was:TWILL:}p$$

$$(P2c) \quad p \rightarrow \text{WAS:TWILL:}p$$

$$(P2d) \quad p \rightarrow \text{WAS:TWILL:}p$$

Within the refined gappist theory under consideration (2) is valid. Intuitively, the reason appears to be the following: from the point of view of the present it was true that it would be the case that p . That is: if you move one day in the past keeping fixed the way things actually turned out to be today, you cannot but conclude that yesterday, in the superficial past, it was true that it would be

the case that p . If (2) is valid, then P2a and P2b are also valid: in the superficial past it was surely true that both in its deep and superficial future it will be the case that p . If we keep the way things turned out to be today fixed and we consider the past from the point of view of today, it is surely true that in the future of the (superficial) past p is the case and, therefore, that it was true that it would be the case that p .

The invalid interpretation of P2 is, for the refined gappist, P2c: if it is now the case that p , this does not entail that in the deep past it was true that it would be the case that p . Once we move on considering the deep past, we are no longer keeping an eye, as it were, on what is currently the case today: we are looking at what was the case yesterday from the point of view of yesterday, when the future still had to unfold. However, the gappist continues, *before* the future unfolded it was neither true nor false that it would be the case that p today. The refined gappist can thus at least claim the following:

- (4) By d-necessity, superficial future-contingent statements are neither true nor false

and, somehow, vindicate her philosophical intuitions.

It seems, however, that if we thoroughly follow this train of thought we cannot but conclude that also P2d must be valid for the gappist. ‘WILL: p ’ refers yesterday to the way things would turn out today not from the point of view of yesterday, but from the point of view of *today*. ‘WILL: p ’ is in fact short of: ‘when tomorrow will be present (from the point of view of tomorrow) p will be the case’. If gappists can, in other words, consistently claim that

- (5) WAS:Twil: p

is not true (since when yesterday was present, its superficial future was neither a p -future or a $\sim p$ -future) and, hence, that P2c is invalid, they do not appear to be in position to reject

- (6) WAS:TWILL: p

and, hence, the validity of P2d: if from the point of view of the present it is the case that p , how could it have been false, even in the deep past, that from the point of view of its future (that is, today) p would be the case?

If these lines of reasoning are correct, it follows that, although the difference between deep and superficial past and future allows the gappist to maintain that it is d-necessary that superficial future-contingent statements are neither true nor false,

$$(7) \quad \blacksquare[(\sim N\text{will}:p \ \& \ \sim N\sim\text{will}:p) \rightarrow (\sim T\text{will}:p \vee \sim F\text{will}:p)]$$

(where ‘ \blacksquare ’ stands for d-necessity) she is committed to the thesis that deep future contingent statements are a-necessarily either true or false (in what follows ‘ \square ’ stands for a-necessity):

$$(8) \quad \square[(\sim N\text{WILL}:p \ \& \ \sim N\sim\text{WILL}:p) \rightarrow (T\text{WILL}:p \vee F\text{WILL}:p)]$$

Although (7) expresses in some way that the thesis the gappist was trying to defend, the fact that (8) is true in her theory shows that (7) is nothing but a pyrrhic victory for her.

The gappist’s main statement is that future-contingent statements are neither true nor false. But within the refined gappist theory we are discussing, there is indeed a class of future-contingent statements (that is: *deep* future-contingent statements) such that they are truth-valued even if unsettled. Therefore, the kind of gappism under consideration is only a weak form of denial of the principle of bivalence in the open future. Not only. Such form of gappism appears at a closer scrutiny to be so weak, to be actually *compatible* with the very spirit, if not the letter, of True-Futurism. As we have seen, the notion of a superficial future intends to capture the way the future *is* and to distinguish it from the way the future *will be*. However, what exactly could it mean, ‘the way the future is’? The only plausible way to make sense of this expression seems to be that of interpreting it as referring to the way in which the present (the entities that now existing plus the specific pattern of fundamental properties and relations obtaining among them and, perhaps, the laws of nature) determines the future. But to say that the future is *unsettled*

appears to be tantamount to saying that the present fails to fully determine how the future will be. Once the distinction between deep and superficial future is accepted it seems thus to become simply analytic that—in *this* specific sense of ‘being true’—*superficial* future-contingent statements are *neither true nor false*. If a superficial future-contingent statement represents the way in which the present settles the future and the future is unsettled, then, for instance, it will be neither true that the way in which the future is settled by the present is such that it will be the case that p , nor false that the way in which the future is settled by the present is such that it will be the case that p (and, hence, true that the way in which the future is settled by the present is such that it will be the case that $\sim p$). This is something that true futurists should be perfectly happy to accept. Their point is, in fact, that, beyond the way in which the present determines and settles the future, there is a determinate way the future will be...*in the future*! True futurists can thus reply to the refined gappists: “The superficial future is but a *faux* future: it is not the *real* future—what *will* happen tomorrow, when tomorrow will be present, but only the *present*—*incomplete*—*projection* of what the future will be. Therefore, when you say that superficial future-contingent statements are neither true nor false you are in fact just saying that the future is unsettled: something which we have agreed on from the very beginning of our discussion”.

These lines of reasoning appear to be plausible enough. However, things actually get worse for the refined gappist, since regardless of the validity of P2d, a simple argument shows that what we might call the ‘weak’ rejection of P2 (that is, the rejection of P2 only limited to P2c) is simply untenable. We can recall that the kind of gappist under consideration upholds both that d-necessarily, superficial future-contingent statements are neither true nor false

$$(9) \quad \blacksquare[(\sim N\text{will};p \ \& \ \sim N\sim\text{will};p) \rightarrow (\sim T\text{will};p \vee \sim F\text{will};p)]$$

and that at least P2a

$$(P2a) \quad p \rightarrow \text{was};T\text{will};p$$

is valid. The validity of (9) entails the validity of the principle according to whether it is now the case that it is neither settled that p nor $\sim p$ then p is neither true nor false

$$(10) \quad \mathbf{NOW}(\sim N\text{will}:p \ \& \ \sim N\sim\text{will}:p) \rightarrow \mathbf{NOW}(\sim \mathbf{T}\text{will}:p \ \& \ \sim \mathbf{F}\text{will}:p)$$

However, (P2a) and (10)—plus some intuitively valid principles governing the behaviour of tense-operators—suffice to conclude the falsity of (9).

ARGUMENT B

- | | | |
|------|---|-------------------|
| (B1) | $\mathbf{NOW}(\sim N\text{will}:p \ \& \ \sim N\sim\text{will}:p)$ | [premiss] |
| (B2) | $\text{will}:(p \vee \sim p)$ | [premiss] |
| (B3) | $\text{will}:(\text{was}:\mathbf{T}\text{will}:p \vee \text{was}:\mathbf{F}\text{will}:p)$ | [from B1, by P2a] |
| (B4) | $\text{will}:\text{was}:(\mathbf{T}\text{will}:p \vee \mathbf{F}\text{will}:p)$ | [from B3] |
| (B5) | $\mathbf{T}\text{will}:p \vee \mathbf{F}\text{will}:p$ | [from B4] |
| (B6) | $\mathbf{NOW}(\mathbf{T}\text{will}:p \vee \mathbf{F}\text{will}:p)$ | [from B1, B5] |
| (B7) | $\sim \blacksquare [(\sim N\text{will}:p \ \& \ \sim N\sim\text{will}:p) \rightarrow (\sim \mathbf{T}\text{will}:p \vee \sim \mathbf{F}\text{will}:p)]$ | [from B1, B6] |

(B2) appears to have ‘the force of a tautology’ (Thomason, 1975), even when the superficial future is concerned. No matter if the future is open or not, it will be the case that either p or not p for every possible p . Rejecting (B2) seems thus to be a desperate manoeuvre. Moreover, the rejection of (B2) and, hence, the truth of

$$(11) \quad \sim \text{will}:(p \vee \sim p)$$

would require the refined gappists to reject also some intuitively valid principles governing the interaction between ‘will:’ and ‘ \sim ’ on the one hand and ‘ $\&$ ’ and ‘ \vee ’ (De Morgan laws) to avoid the catastrophic conclusion according to which it is true that:

$$(12) \quad \text{will}:(\sim p \ \& \ p)$$

The passage from (B2) to (B3) is based on the principle of retrospective determinacy for superficial tense-operator which, as I have argued, the refined gappist is forced to accept in virtue of the very deep/superficial past/future distinction. (B4) is obtained by (B3) by the agglomeration principle for the superficial past-tense operator

$$(AG) \quad (\text{was}:P \ \& \ \text{was}:Q) \rightarrow \text{was}:(P \ \& \ Q)$$

It is true that when it comes to the open future some apparently intuitive principles governing the interaction between operators and Boolean connectives have to be rejected by gappists. For instance, gappists appear to have to reject either the fact that the future-tense operator or the truth-operator distributes over disjunction

$$(FD) \quad F(p \vee q) \rightarrow (Fp \vee Fq)$$

$$(TD) \quad T(p \vee q) \rightarrow (Tp \vee Tq)$$

since, otherwise the following argument would be valid:

ARGUMENT C

- | | | |
|------|----------------------|------------------|
| (C1) | $TF(p \vee \sim p)$ | [premiss] |
| (C2) | $T(Fp \vee F\sim p)$ | [from C1, by FD] |
| (C3) | $TFp \vee TF\sim p$ | [from C2, by TD] |
| (C4) | $TFp \vee FFp$ | [from C3] |

However, rejecting AG would seem really odd. ‘was: P & was: Q ’ and ‘was:(P & Q)’ appear in fact to be equivalent formalisations of ‘it was both the case that p and q ’. What could it mean that it was the case that P and that it was the

case that Q but it was not the case that P and Q ? Similarly, the passages from (B4) to (B5) and from (B5) to (B6) appear to be hardly questionable.¹

It follows that, at least *prima facie*, gappists cannot reject A's conclusion by rejecting P1 in light of the distinction between two dimensions of pastness/futurity. Therefore, the culprit for A's conclusion must be the principle of retrospective determinacy.

5. Retrospective determinacy: an argument from aboutness

As we have seen, the principle of retrospective determinacy appears to be an intuitively valid principle about the past truth-status of past future-contingent statement. However, the validity of the principle can be traced back to what appears to be a *prima facie* platitude about *future-directed* statements, that is, their being *about the future* of the moment in which they are made. Consider, in fact, the following argument (' mI ' is the moment that obtained yesterday):

ARGUMENT D

- | | | |
|------|---|---------------|
| (D1) | It is now the case that p | [premiss] |
| (D2) | In the future of mI , it is the case that p | [from D1] |
| (D3) | Fp was about the future of mI | [premiss] |
| (D4) | Fp was true if, and only if, in the future of mI it
is the case that p | [from D3] |
| (D5) | Fp was true | [from D2, D4] |

¹ As for the passage from (B4) to (B5), the tacit assumption is that the superficial tense-operators in argument D are metric tense-operator of the form 'it was/will be the case that n time-units ago/hence'. Therefore, the general principle underlying the passage from (B4) to (B5) is:

$$(P) F_n P_n p \rightarrow p$$

Now m_2 is present and p obtains. m_2 has become present one day after m_1 . Therefore, it is true that in the future of m_1 it is the case that p . Fp was about the future of m_1 and, thus, Fp was true if, and only if, in the future of m_1 it is the case that p . Since that is in fact the case, we cannot but conclude that it was true that Fp and, hence (since the argument clearly generalises), that the principle of retrospective determinacy is valid.

At first glance, it may seem that the gappist might declare argument D invalid by blaming the passage from (D3) to (D4) and claiming that (i) what only follows from (D3) is

(D4') Fp was true if, and only if, *it was the case that* in the future of m_1 it is the case that p

and (ii) From (D2) and (D4') one cannot conclude (D5). However, as we have seen in the previous section, it seems that gappists must reject the deep/superficial past/future distinction. It is clear that without such distinction no meaningful difference between (D4) and (D4') can be invoked. If, in fact, we cannot distinguish between the future of m_1 *from the point of view of m_1* and the future of m_1 *from the present point of view*, we are only left with *the future of m_1 simpliciter*. To accept that the future of m_1 *is now* such that p obtains, but *was not* such that p would obtain, is just to say that the way the future of m_1 is (now) can differ from the way the future of m_1 was (when m_1 was present). Without the possibility of distinguishing between the way the future *is* and the way the future *was*, the passage from (D3) to (D4) is clearly valid: if 'It will be the case that p ' was (as it appears to be) about the future of m_1 (stating, thus, that in the future (of m_1) it will be the case that p), then 'It will be the case that p ' was true if, and only if, in the future of m_1 it is the case that p . It follows that this kind of gappist, to resist D's conclusion, must reject (D3) and, hence, claim that future-contingent statements *are not about the future*.

6. Simple Reductive Gappism

Let us take stock. Argument A proves that future-contingent statements are truth-valued and, hence, that Gappism is false. In order to resist A's conclusion, the gappist can either appeal to the distinction between a deep and superficial past and future or reject the principle of retrospective determinacy altogether. However, the distinction between the two dimensions of pastness and futurity entails the validity of some refined versions of Retrospective Determinacy (in particular P2a and P2d) that are (respectively) at odds with Gappism and compatible with True-Futurism. Therefore, the gappist has to reject P2 altogether along with the distinction between the past/future as it was/will be and the past/future as it is. However, the principle of retrospective determinacy appears to be grounded in the very idea that future-contingent statements are about the future. Therefore, in order to reject the thesis that future-contingent statements are truth-valued, the gappist has to uphold the thesis that (the so-called) 'future'-contingent statements are not about the future.

But what could it mean that future-directed statements are not about the future? I see two only possible answers:

- (i) future-directed statements are not about anything
- (ii) future-directed statements are about the present

According to the first option, future-directed statements are not about anything. However, if any future-directed statement is not about anything, it seems difficult to deny that every future-directed statement is *as such* gappy. In other words, gappists are burdened with having to explain why future-contingent statements are neither true nor false. On the other hand, it appears that if future-directed statements are not about anything, then this must be the reason why future-contingent statements and, hence, all future-directed statements are gappy. This, however, does not seem to be correct. On the one hand, in fact, there are logical truths like:

$$(13) \quad p \vee \sim p$$

and

$$(14) \quad \sim(p \ \& \ \sim p)$$

such that, when prefixed by the future-tense operator, appear to yield true statements:

$$(15) \quad F(p \vee \sim p)$$

$$(16) \quad F\sim(p \ \& \ \sim p)$$

On the other hand, there appear to be complex propositions such that, although formed by future-contingent propositions (which for the gappist would be neither true nor false if taken alone) are nevertheless truth-valued such as

$$(17) \quad Fp \vee F\sim p$$

or (taking p to stand for ‘Socrates exists’ and supposing both that Socrates exists now and that it is metaphysically impossible that something begins to exist again, after it has ceased to exist)

$$(18) \quad FFp \rightarrow Fp^2$$

If future-directed statements were not *as such* about anything and, hence, as such, neither true nor false, then also (14), (15), (16) and (17) would have to be assessed as neither true nor false, contrary to what our intuitions appear to strongly mandate.

It follows that future-directed statements must have some sort of truth-conditions and, therefore, given the intuitive validity of principle (AB-TC), must be about something. But what can future-directed statements be about if not the future? The only plausible candidate I see is *the present state of the world*. As a matter of fact, I am arguing that (i) gappists have to reject the

² These appear to be the counterparts in an open future setting of what Kit Fine has called ‘penumbral connections’ in the case of vagueness (see Fine 1975).

principle of retrospective determinacy to be able to claim that, necessarily, future-contingent statements are neither true nor false and (ii) that future-directed statements, although about something, are not about the future. Therefore, gappists seem to be obliged to claim that

- (i) future-directed statements are about something
- (ii) future-directed statements are truth-valued if, and only if, they are now-settled, that is: they are settled by the present state of the world

However, the conjunction of (i) and (ii) appears to at least strongly suggest that what future-directed statements are about is, in fact, the present state of the world, and in particular, the way in which the present state of the world pre-determines the future. Gappists can in fact say: a future-directed statement P is true(false) if, and only if, the present state of the world is such to necessitate $P(\sim P)$; otherwise P is neither true nor false.

7. Refined Reductive Gappism

As we have seen in section 3, Refined Gappism (the gappist theory that distinguishes between deep and superficial past and future) has troubles with the following disambiguations of P2:

(P2a) $p \rightarrow \text{was:will:}p$

(P2d) $p \rightarrow \text{WAS:WILL:}p$

This led us to conclude that Refined Gappism is an untenable theory. However, at a closer look, that conclusion was a little too rash, since the refined gappist appears in fact to be in position to try and maintain the deep/superficial past and future distinction without committing herself to the validity of P2a and P2d.

First, she can resist argument B's conclusion by claiming that what only argument B shows is that principle P2a is not a-necessary, but only d-necessary. At any moment m in time considered as present (that is: from the point of view of m itself) it is true that if p , then in the superficial past it was the case that in the superficial future it would be the case that p . But this is not always the case at moments not considered as present. If, in fact, in the superficial future it will be the case that either p or $\sim p$, we cannot conclude by constructive dilemma that in the superficial future it will be the case that either was:Twill: p or was:Twill: $\sim p$. On the one hand, in fact, the superficial future is in fact nothing but what it is settled by the present state of the world; on the other hand, the superficial past of the superficial future is just the present. Therefore, to say that in the superficial past of the superficial future it is the case that either will: p is true or will: $\sim p$ is true is just tantamount to saying that in the present either will: p is true or will: $\sim p$ is true. However, for the gappist the present can be such as to settle the truth of *it will be the case that either p or $\sim p$* without actually settling either the truth of *it will be the case that p* or *it will be the case that $\sim p$* . Only from the point of view of the present, concludes the gappist, there is always Retrospective Determinacy.

As for P2d, consider the following disambiguation of argument D given the deep/superficial past/future distinction (for reasons that will be clear below) I will keep the ambiguous ' Fp ' for the future-contingent statement in question; the capitalised 'WAS' signals the presence of a deep-past tense-operator in the logical form of the sentence):

ARGUMENT E

- | | | |
|------|---|-----------|
| (E1) | It is now the case that p | [premiss] |
| (E2) | In the deep future of mI , it is the case that p | [from E1] |
| (E3) | Fp WAS about the deep future of mI | [premiss] |
| (E4) | Fp WAS true if, and only if, in the deep future of mI it is the case that p | [from E3] |

(E5) Fp WAS true

[from E2, E4]

Now $m2$ is present and p obtains. $m2$ has become present one day after $m1$. Therefore, it is true that in the deep future of $m1$ it is the case that p . In the deep past Fp was about the deep future of $m1$ and, thus, in the deep past WILL: p was true if, and only if, in the deep future of $m1$ it is the case that p . Since that is in fact the case, we cannot but conclude that in the deep past it was true that Fp and, hence (since the argument clearly generalises), that P2d is valid.

As it happened with argument D, at first glance it may seem that the gappist might declare argument E invalid by blaming the passage from (E3) to (E4) and claiming that (i) what only follows from (E3) is

(E4') Fp WAS true if, and only if, *it WAS the case that* in the deep future of $m1$ it will be the case that p

and (ii) From (E2) and (E4') one cannot conclude (E5). However, in order to distinguish between (E4) and (E4') one has to distinguish between the deep future *as it is* and the deep future *as it was* and hence distinguish between a *superficial* deep-future and a *deep* deep-future. Clearly, this move can only shift the problem to another level, since in that case it would be sufficient to rephrase argument E substituting deep tense operators and deep temporal expressions with deep-deep ones. At that point, distinguishing between a superficial deep-deep future and a deep, deep-deep future would just be tantamount to embarking in what would seem to be a vicious infinite regress that—I submit—gappists would not be happy to be committed to. Therefore, the only option available for the refined gappist is to reject premiss (E3) and deny that future-directed statements are about the deep future. The *refined reductive gappist* introduces, thus, an asymmetry between the past and the future: while we can talk both about the superficial and the deep past, we can only talk about the superficial future, that is what is settled by a certain state of the world at a certain time.

8. No (deep) future for us?

Refined Reductive Gappism, contrary to Reductive Simple Gappism manages to maintain a certain form, if weak, of Retrospective Determinacy and thus appears to be preferable to its sister theory. Both theories, however, appear to *reduce* the truth value of our future-directed talk to what is settled by the present state of the world and thus deny the possibility of talking about or even referring to the ‘real’ (deep) future. Unfortunately, this position appears to have some unwelcome consequences that—as I shall argue—should ultimately lead to its rejection and, hence, to the acceptance of True Futurism as the right stance on future-contingent statements.

In the following, I will address argument D. As it will be clear, however, everything I will argue against the simple reductive gappist also holds for — *mutatis mutandis*—the refined reductive gappist: it is sufficient to substitute ‘deep future’ with ‘future’ where appropriate.

8.1 The present is *the future* of the past

Return now to the second line of argument D

(D2) In the future of $m1$, it is the case that p

which is inferred by the fact that (i) it was the case that $m1$ obtains and (ii) it is now the case that p . How can our gappist uphold (D2)? It does not seem she can: for her, in fact, our future-talk is only about what is settled about the present and it is true even now that what was the case at $m1$ was such as not to settle whether it would have been the case that p or not in the future. Therefore, the gappist must reject (D2). Not only. By generalising from this point she also has to claim that

(19) This moment ($=m2$) is not the future of $m1$

since the fact that the present moment $m2$ obtains is not settled by the fact that $m1$ obtains. Hence, it seems that the gappist must commit herself to the incredible claim that *while $m1$ is the past of $m2$, $m2$ is not the future of $m1$.*

This, however, strikes as clearly absurd: if $m1$ obtained in the past, then this very moment is clearly the future of $m1$ —what has happened *after* $m1$ has obtained—even if $m1$ did not settle $m2$ to obtain. Therefore, the gappist has to acknowledge that $m2$ is the future of $m1$. But, in order to acknowledge that, she also has to acknowledge a notion of future that is not exhausted by what is settled by the present and, hence, to admit that, contrary to what the rejection of argument D’s conclusion appears to require her, future-directed talk can be about the real future.

8.2 Possible futures vs. the settled present state of the world

It appears natural to model the open future by means of a branching tree of possible histories. Within a branching setting, the future of a certain moment to is open if, and only if, there is a plurality of possible histories sharing a common past up to m and branching afterwards. Intuitively, such histories represent all the possible ways ‘the *future* might turn out to be’.

Consider then a certain history h passing through the present moment m and call H the set of all and only the propositions true with respect to h (and m). H can be divided in two proper subsets SETT and FUT: SETT is the set of propositions that are settled at m ; FUT is the set of propositions that are true with respect to h but unsettled with respect to m . Intuitively, FUT represents a possible way ‘the future’ might turn out to be. However, in order to grasp *this* notion of the future and make sense of it, one has to be able to grasp and refer to a notion of future that exceeds what is simply settled by the present. The possible future that is represented in h is not (simply) a possible way the gappist’s *reductive* future might turn out to be: it is a possible way the *real and deep future* might turn out to be; the future that isn’t exhausted by what is settled by the present.

As a matter of fact, when gappists say that “the future” is unsettled, they cannot thereby refer to the reductive future: what is, in fact, settled by the present is not open, but as well settled. The reductive future (the way in which the present settles the future) is thus settled, by definition. What is open is the deep future, that is the way the future will be beyond what is settled by the

present state of the world. It is the deep future that can now go one way or the other and precisely because it is not settled by the present state of the world.

It appears thus that not only the possibility of modelling the openness of the future by means of branching histories, but also the very idea of an *open* future requires the ability to grasp and talk about a notion of future that is not simply exhausted by what is settled by the present state of the world.

9. The argument

The upshot of the considerations put forward above is that (at least part of) our future-directed talk employs—and indeed *requires*—a notion of deep future, that is a notion of the future as it will be beyond what is settled by the present moment. This allows us to refine the True-Futurist position as consisting in the conjunction of the following claims:

Refined True Futurism

- (TF1) Our future-directed discourse features (at least in part) a notion of future that exceeds—in principle—what is simply settled by the present (=the deep future).
- (TF2) Some (deep-) future-directed statements are settled; others are unsettled.
- (TF2) Necessarily, every (deep-) future-directed statement is either true or false.

As we have seen in section 3, True-Futurism is better understood not as the theory according to which future-contingent statements *simpliciter* are neither true nor false, but as the theory which affirms the absolute necessity of the principle of bivalence for statements that are about the deep and real future of a moment, that is the dimension of future possibly exceeding what the present

state of the world settles. The argument for true futurism can thus be seen as an argument from the meaningfulness of the notion of deep future.

From what I have argued above, it follows in fact, that once the notion of a deep future is accepted as meaningful and, hence, the existence of propositions about the deep future is acknowledged, the following argument (merging together arguments A and D(E)) is valid.

ARGUMENT F

- (F1) Now, the moment m_2 obtains [premiss]
- (F2) In the past, the moment m_1 obtained [premiss]
- (F3) This moment (m_2) is the (deep) future of m_1 [from F1, F2]
- (F4) It is now the case that p [premiss]
- (F5) The (deep) future contingent statement Fp was [premiss]
about the (real, deep) future of m_1
- (F6) The (deep) future contingent statement Fp was [from F4]
true if, and only if, in the (deep) future of m_1 it is
the case that p
- (F7) Fp was true (at m_2), even though unsettled [from F3, F4, F6]
- (F8) It is not (a-)necessary that (deep) future- [from F7]
contingent statements are gappy
- (F9) (deep) Future-contingent statements are either [premiss]
(a-)necessarily gappy or (a-)necessarily truth-
valued
- (F10) (deep) Future-contingent statements are [from F8, F9]
(a-)necessarily truth-valued

We can thus finally appreciate the importance of the principle of retrospective determinacy in the Gappism/True Futurism debate. The principle of retrospective determinacy allows us to understand what the present truth-status of future-contingent propositions is by looking at other moments in time from the advantaged point of view of their future. By so doing, it is possible for us to realise that the unsettledness of the future is perfectly compatible with future-contingent statements' being truth-valued and, hence, that the principle of bivalence is indeed valid for future-directed statements as such.

10. Against MacFarlane's relativist theory

The argument exposed in favour of True-Futurism and against Gappism clearly applies also to MacFarlane's relativist theory for the open future.³ As a matter of fact, the deep/superficial past/future distinction characterising Refined Gappism is based on the distinction between the two ways of considering a moment in time.

- as the moment m at which a certain statement has a certain truth-value (or not)
- as the moment m' from the perspective of which a certain statement has a certain truth-value (or not) at m

This distinction is clearly mirrored within MacFarlane's relativist framework in the distinction between the *context of use* (the context in which a certain sentence is uttered or used) and the *context of assessment* (the context from which a certain sentence is assessed as uttered in a certain context of use). According to MacFarlane, although from the point of view of today, it is

³ In what follows I will implicitly address MacFarlane's first theory on future contingent statements (see MacFarlane 2003). In his second paper on the subject (MacFarlane 2008) he, in fact, advances a new theory for the open future according to which, at least at the object-language level, the principle of bivalence is valid.

neither true nor false that it will be sunny tomorrow, it is correct to say from the point of view of today (which we can suppose to be a sunny day) that it was true yesterday that it would be sunny today. This means that for MacFarlane, the principle stating the entailment from the unsettledness of the future to the gappiness of future-contingent statements is only *diagonally valid*, that is it is only true when the context of use and the context of assessment coincide.

At this point, however, MacFarlane is faced with a choice: either his gappist theorist can express in her object-language the main statement characterising Gappism in all its modal force or not. Clearly, the second possibility—that we might label *Ineffable Gappism*—cannot be a real option. Therefore, MacFarlane must concede the existence in the object-language of his theory of operators capable of shifting the context of assessment⁴ to ensure that gappists are able to state their gappist *credo* while debating with their detractors and to say things like:

- (20) From the point of view of today, it was true that it would be sunny today, but from the point of view of yesterday it was neither true nor false

But, clearly, these kinds of operators are nothing but the counterpart in MacFarlane's framework of our deep tense-operators 'WILL:' and 'WAS:' and thus the criticism advanced above against Refined Gappism and Reductive Refined Gappism also applies to MacFarlane's case. Consider, in fact, the following statement

- (21) From the point of view of tomorrow it is true that it will be sunny tomorrow

and call it *S*. Suppose then that today is indeed a sunny day. MacFarlane is thus faced with a choice: either the following statement is true or not.

- (22) From the point of view of yesterday *S* was true

⁴ According to the Kaplanian terminology, such operators would be 'monsters' (see Kaplan 1989).

If (22) is true, then True-Futurism is vindicated, since (22)—the true-futurist can say—is about the deep future of yesterday (what will happen in the future from the point of view of the future) and its being true entails that, therefore, deep future-contingent statements are a-necessarily either true or false. If (22) is false it must be because the expression ‘from the point of view of tomorrow’ fails to really refer to the point of view of tomorrow and is in fact equivalent to the expression ‘from the point of view of today’, so that, yesterday, (22) is in fact equivalent to

(23) From the point of view of today it is true that it will be sunny tomorrow

and, hence, also to

(24) It is true that it will be sunny tomorrow

Consider, in fact, the following argument:

ARGUMENT G

(G1) It is sunny today [premiss]

(G2) In the deep future of *ml*, it is sunny the next day [from G1]

(G3) From the point of view of yesterday, *S* was about the deep future of *ml* [premiss]

(G4) From the point of view of yesterday, *S* was true if, and only if, in the deep future of *ml* it is sunny the next day [from G3]

(G5) From the point of view of yesterday, *S* was true [from G2, G4]

As with arguments D and E, the only option for MacFarlane is that of rejecting premiss (G3). But once premiss (G3) is rejected it follows that deep future-

directed statements like ‘from the point of view of tomorrow it is now true that it will be the case that p ’ are in fact about the present state of the world and what the present state of the world settles about the future. But then again, if the only ‘future’ we can refer to and talk about is the superficial future (in this case: the future as seen from the context of assessment of the present), then:

- What does MacFarlane mean when he claims that ‘the future’ is open?
- In which sense can he claim that the possible histories branching from the present moment represent ways ‘the future’ might turn out to be?
- How can he avoid being committed to the incredible claim that, while (the past moment) $m1$ is in the deep past of (the present moment) $m2$, $m2$ is not in the deep future of $m1$?

MacFarlane’s relativistic kind of Refined Gappism does not seem, therefore, to manage to escape the criticism I put forward against Refined Gappism in general, and is thus to be rejected in favour of True-Futurism.

11. A final worry: branching worlds

Until now, I have not assumed any specific metaphysical stance on time in my argument. However, there is at least one possible way to metaphysically conceive the openness of the future that appears either to mandate a (simple or refined) reductive gappist treatment and, hence, the falsity (or meaningless) of claims like:

(25) It WAS the case that it WOULD be the case that p

or

- (26) From the point of view of yesterday it was true that from the point of view of today it was then true that it would be sunny today

Such a metaphysical picture of the open future is the static *branching-worlds* picture, according to which a plurality of concrete world exists, overlapping towards the past and branching towards the future with no world being somehow distinguished or singled out as representing *the* way things will turn out to be.⁵

According to the branching-worlds picture, the moment *m1* that obtained yesterday has, even from the point of view of today, many concrete possible futures, only in one of which the moment *m2* obtains. It seems, therefore, that a theorist upholding a gappist stance in the open future is somehow legitimised to claim that the principle of retrospective determinacy is simply invalid in the open future, and that it is now true to say

- (27) $P \sim \mathbf{TF}p$

even if is now true that *p*.

The gappist might of course refine its theory and distinguish between deep and superficial past, and so claim—as MacFarlane does—that while

- (28) $\mathbf{WAS:T:will:p}$

is false,

- (29) $\mathbf{was:Twill:p}$

is now true. Even so, it appears that the refined gappist is nevertheless obliged to claim that

- (30) $\mathbf{WAS:TWILL:p}$

is either false or meaningless. As a matter of fact, if every possible way the future could turn out to be is an atemporally existing concrete world, where every world is ontologically on a par and no world is singled out as *the* way

⁵ See Lewis (1986).

things will turn out to be, we cannot infer from the mere fact that we are located at $m2$ that, *therefore*, $m2$ is the deep future of $m1$ considered without keeping fixed the fact that $m2$ ‘has become present after’ $m1$. Even if we are located at $m2$, we have to acknowledge that $m2$ is not *the* deep future of $m1$, because $m2$ is but one of the many concretely existing ‘futures’ of $m1$.

It seems thus that the argument in favour of True-Futurism that I have advanced in this paper has at best a limited validity, since it appears to rest in fact on some tacit metaphysical assumptions.

I think, however, that appearances are in this case deceptive and that the worry just reviewed about the branching-worlds scenario, far from showing any shortcoming in the argument I have exposed here, points instead to the problematic character of the branching-worlds theory as a theory for the open future. An argument parallel to arguments D, E and G shows in fact that also the gappist branching theorist is committed to rejecting the thesis that future-directed statements are about the deep future. If that is the case, however, it also follows that the gappist branching-worlds theorist is beset with the problems that surround any kind of refined gappist theory: if ‘future’-directed statements are in fact only about the superficial future, in what sense can the ‘future’ be open? In what sense are moments later than the present moment on worlds branching off the present moment be possible ways the ‘future’ might turn out to be?

In particular, in the branching-worlds case, the issue related to the asymmetrical relation between past and future ($m1$ is the [deep] past of $m2$, even if $m2$ is *not* the [deep] future of $m1$) is particularly telling. As a matter of fact, the correct response to the seemingly paradoxical conclusion that $m2$ is neither the superficial nor the deep future of $m1$ appears to be in this case that of saying that $m2$ is just *one* of the (deep) futures of $m1$. If all the concrete possible worlds in the branching multiverse are simply on a par, then the correct thing to say is not that $m2$ is not the future of $m1$, but that it is just one of its many futures. The future of $m1$ is thus not open or unsettled: it is just not unique. It is therefore not the case that ‘the future’ might go one way or the other and it is presently unsettled which way it will go. There are *many* futures,

and it is both the case that (i) for every future f it is settled that f is so-and-so and that (i) it is settled that there are many equally existing futures ahead of us.

Therefore, I conclude that the worry sketched in this section about the branching-worlds theory just shows that, in the absence of a ‘thin red line’,⁶ a branching-worlds scenario is actually not an ‘open future’ scenario and, hence, poses no threat whatsoever to the argument for True-Futurism.

12. Conclusion

Intuitively, saying that the future is open is just saying that the way the present settles the future fails to completely determine its course. In turn, saying that the way the present settles the future fails to completely determine its course is just tantamount to saying that, when we talk about the future, we are talking about a temporal dimension that is not exhausted by—and goes, therefore, beyond—what is settled by the present. If we call ‘superficial’ future the way the future is settled by the present, this train of thought shows that in order to entertain the very idea of an open future, we have to be able to grasp and talk about the ‘deep’ future, that is the dimension of the future that goes (possibly) beyond what is settled by the present. However, if there are deep-future-directed propositions, and if we can produce deep-future-directed statements, then it follows that the principle of retrospective determinacy is valid and, hence, that (since it is not the case that necessarily future-contingents statements are neither true nor false) True-Futurism is correct.

I conclude, therefore, that the principle of bivalence is not threatened by the hypothesis that the future is open in some robust, objective, and metaphysical sense and, thus, that True-Futurism is the correct theory about future-contingent statements.

⁶ See chapters 5, 6 and 7.

Chapter 4

Bivalence and Indeterminacy

1. Introduction

Recently, some authors have proposed a family of theories featuring a rather unorthodox form of gappism, which I will here label *Determinacy Gappism*.¹ According to Determinacy Gappism, unsettledness does not give rise to truth-value gaps, but to *determinacy* gaps instead. In other words, while for determinacy gappists, for every statement p , it is *determinately* the case that p is either true or false

$$(1) \quad \mathbf{Det}(Tp \vee Fp)$$

future-contingent statements (such as ' Fp ', 'It will be the case that p ') are neither determinately true nor determinately false

$$(2) \quad \sim \mathbf{Det}TFp \ \& \ \sim \mathbf{Det}FFp$$

In this chapter, I will briefly discuss the relation between Determinacy Gappism and True-Futurism, and argue that Determinacy Gappism poses no serious threat to the main core of True-Futurism. My strategy will be the following:

¹ See MacFarlane (2008), Barnes and Cameron (2009) and Greenough (ms.).

- (i) Firstly, I will argue for a view that I shall label *Definite Futurism*, according to which future-contingent statements are either *definitely* true or *definitely* false.
- (ii) Secondly, I will conclude that determinacy gappists cannot construe their notion of determinacy along the lines of the notion of definiteness characterizing Definite Futurism.
- (iii) Finally, I will show that the notion of indeterminacy invoked by determinacy gappists should be understood either as lack of grounding, or as lack of definite grounding for future-contingent truths. For this reason, I will conclude that, far from contradicting True-Futurism, Determinacy Gappism can be seen as a way to address the question about whether future-contingent truths are grounded in reality.

2. Definiteness Gappism

Suppose that two novelists—A and B—write two short stories about a certain fictional character called ‘Mr. Smith’. In both stories Mr. Smith goes to a party wearing a blue necktie, and we are told that those wearing a blue necktie at that party are either bankers or professors. In the first story, novelist A specifies that Mr. Smith is a professor; in the second story, novelist B tells us simply that Mr. Smith wears a blue necktie without specifying—or giving us any clue to understand—whether Mr. Smith is a professor or a banker. Suppose, furthermore, that John is asked to read both stories—that we might label ‘story A’ and ‘story B’, after their authors—and to answer some simple questions about them, and that the manuscript of story A that is given to John is missing the page in which novelist A specifies that Mr. Smith is a professor. Imagine that, after being asked about Mr. Smith’s profession in both stories, John says, that in both cases

- (3) Mr Smith is a professor

Clearly, with respect to both stories there appears to be something wrong with this kind of answer. However, there appears to be something *specifically* odd with (3) with respect to story B. In both cases John not only does not *know* what is Smith's profession, but he has also no evidence at all available that can make him reasonably suppose that Smith is a professor. In the case of story B, however, it is not only John's lack of knowledge that makes the assertion of (3) odd, but it is the fact that story B itself does not mention whether Smith is a professor or not. In the scenario we are imagining Jones knows everything there is to know about story B. Nevertheless, that is insufficient for him to be in position to assert that Smith is a professor. By asserting that Smith is a professor, Jones appears to implicate that story B specifies Smith's profession in a way it actually does not. If John knows that novelist A has specified in story A whether Smith is a professor or not, whereas novelist B has not, it seems that the best answer that John can give about both stories is the following:

- (4) In story A, either Smith is *definitely* a professor or he is *definitely* a banker; in story B, instead, although Smith is *definitely* either a professor or a banker, he is neither *definitely* a professor nor *definitely* a banker.

In this case, although we do not have a gap in truth-value, we do have thus a gap in *definiteness*, since we have statements that are neither definitely true nor definitely false. I shall label any theory that allows there to be gaps in definiteness, *definiteness gappist*.²

Let us now return to the open future. The possible threat that Definiteness Gappism might pose to True-Futurism is that of making—for an arbitrary future-contingent statement Fp —‘it is either true that Fp or false that Fp ’ the *most specific* claim one could make about Fp 's truth-value, in the sense just

² A similar kind of treatment of truth in fiction can be found in Stone (2010). However, Stone posits truth-value gaps, instead of gaps in definiteness.

reviewed of ‘can’. Definiteness gappists, in other words, might claim that although it is definitely the case that Fp is either true or false

$$(5) \quad \mathbf{Def}(TFp \vee FFp)$$

it is neither definitely the case that Fp is true nor it is definitely the case that Fp is false

$$(6) \quad \sim\mathbf{Def}TFp \ \& \ \sim\mathbf{Def}FFp$$

thereby implying that that reality itself is—somehow—such that there is simply no further fact of the matter about Fp ’s truth-value beyond the fact that Fp is either true or false. Although Definiteness Gappism is indeed a true-futurist theory—upholding that the principle of bivalence is unrestrictedly valid—it seems to subtly betray the very true-futurist intuition. As a matter of fact, the very core of the true-futurist idea seems to be that the truth-status of future-directed statements is in no way affected by the fact that the future is open, so that, for instance, future-contingent statement should enjoy the very kind of truth-status of historically settled statements. However, definiteness gappists claim instead that the historical contingency of future-directed statements in an open future setting entails that the future is *indefinite* and, hence, that future-contingent statement—although bivalent—have no *definite* truth-value. The question that should concern us here is, therefore, whether determinacy gappists can interpret their notion of indeterminacy as indefiniteness.

3. An argument for Definite-Futurism.

Suppose, that in some situation s , p is true (‘[in- s]’ will stand here for the operator ‘in the situation s , it is the case that’):

$$(1) \quad [\text{in-}s]Tp$$

If p is true in s , then it is false that ‘it is either true or false that p ’ is the *most* specific claim that can be made about p in s since, clearly, the most specific

claims are in that case ‘ p is true’ and ‘ p is false’ (where, clearly, the first is true and the second is false). How can we then say that p is *not* definitely true in s ?

If p is neither definitely true nor definitely false, then it is true to say that its truth-value is indefinite. To say that p ’s truth-value is indefinite is to say that, although it is true to say that p is either true or false, the way reality is, is such as to not specify further p ’s truth-value. In other words, if p ’s truth-value is indefinite, then saying that p ’s truth-value is *either the True or the False* is just to reach the level of maximal specification about p ’s truth-value allowed by reality itself, so to speak.

If, however, it is *true* that, in a situation s , p is true, then it appears we cannot say that, in s , p ’s truth-value is indefinite. As a matter of fact, if p is true in s , then in s , p has a *definite* truth-value, that is: the *True*. The following principle appears, in other words, to be valid (using ‘**Def**’ for the operator ‘it is definitely the case that p ’):

$$(TDF) [in-s]Tp \rightarrow [in-s]DefTp$$

One might object that (TDF) cannot be accepted, since it delivers the unwelcome result according to which, if in a situation s , p is not definitely true, then it is true to say that, in s , p is not true. The argument is the following:

ARGUMENT TD

(TD1)	$[in-s] \sim DefTp$	[premiss]
(TD2)	$\sim [in-s] DefTp$	[from TD1 by Contraposition]
(TD3)	$\sim [in-s] Tp$	[from TD2 by TDF]
(TD4)	$[in-s] \sim Tp$	[from TD3]

Beyond the validity of Contraposition (which I shall not put into question here)³ argument TD implicitly relies on two principles governing the interaction between the operators ‘ $[in-s]$ ’ and ‘ \sim ’:

³ As it is well known, Contraposition is not valid within supervaluationist frameworks (for a discussion on this point see, for instance, Varzi 2007). In case of argument (TD) I am therefore allowing

$$(IN1) \quad [in-s]\sim p \rightarrow \sim[in-s]p$$

$$(IN2) \quad \sim[in-s]p \rightarrow [in-s]\sim p$$

IN1 appears to be intuitively valid: If in s , it is not the case that p , then clearly it is not the case that, in s , p is the case. On the contrary, the validity of IN2 appears to be dubious. To say that is not the case that, in a certain situation s , p is the case is not necessarily to say that, in s , p is not the case: when, in s , it is neither definitely the case that p , nor definitely the case that $\sim p$, ‘in the situation s , p or $\sim p$ ’ appears to be the most specific claim that could be made about the status of p in s . If that is indeed the case, however, it appears also correct to deny that in the situation s , p is the case: if the status of p is not specified in s , then—in a relevant sense—it is not the case that, in s , p is *the case*; in s , it is *only* the case that either p or not p : no more specific fact obtains, in s , about p . Consider again the case of the stories A and B: in B it is not specified whether B is a professor or a banker; therefore, although it is correct to say that in B Smith is either a professor or a banker, it seems also correct to *deny* both that, in B, Smith is a professor and that, in B, Smith is a banker. I conclude, therefore, that IN2 should be best seen as invalid and that, hence, TDF can be safely acknowledged by anyone as a valid principle.

Let us then return to Determinacy Gappism. According to determinacy gappists, the principle of retrospective determinacy—which we might re-label ‘principle of retrospective truth’, in order to avoid confusion—is valid:

$$(2) \quad p \rightarrow PT Fp$$

However, given what we just said, if it was the case, say: yesterday, that it is true that it will be the case that p , then it should follow that yesterday Fp ’s truth-value was *definite* and, hence, that yesterday it was definitely true that it would be the case that p . From this it follows that if the principle of retrospective truth is valid, then also the principle of ‘retrospective definite truth’ must be valid

determinacy gappists who employ a form of supervaluationism in their theory (as Barnes and Cameron do) to use such a rule of inference, even if it is not universally valid in their framework.

$$(3) \quad p \rightarrow P\mathbf{DefTF}p$$

If, however, the principle of retrospective definite truth is valid, then—granted the validity of the principle stating that the *definiteness status* of future-contingent statements is necessary:

(PD1) Either it is necessary that future-contingent statements are either definitely true or definitely false, or it is necessary that future-contingent statements are neither definitely true nor definitely false

$$\begin{aligned} & \Box[(\sim NFp \ \& \ \sim N\sim Fp) \rightarrow (\mathbf{DefTF}p \vee \mathbf{DefFF}p)] \vee \\ & \Box[(\sim NFp \ \& \ \sim N\sim Fp) \rightarrow (\sim \mathbf{DefTF}p \vee \sim \mathbf{DefFF}p)] \end{aligned}$$

it is possible to argue, by means of an argument parallel to argument A (see chapter 3), that future-contingent statements are either definitely true or definitely false. The argument from the necessity of the definiteness status of future-contingent statements to the validity of the principle of definite bivalence goes as follows:

ARGUMENT AD

- | | | |
|-------|---|-------------------|
| (AD1) | p | [premiss] |
| (AD2) | $P(\sim NFp \ \& \ \sim N\sim Fp)$ | [premiss] |
| (AD3) | $P\mathbf{TF}p$ | [from AD1 by (6)] |
| (AD4) | $P\mathbf{DefTF}p$ | [from AD3 by TDF] |
| (AD5) | $P(\sim NFp \ \& \ \sim N\sim Fp \ \& \ \mathbf{DefTF}p)$ | [from AD2, AD3] |
| (AD6) | $\sim \Box[(\sim NFp \ \& \ \sim N\sim Fp) \rightarrow (\sim \mathbf{DefTF}p \vee \sim \mathbf{DefFF}p)]$ | [from AD4] |
| (AD7) | $\Box[(\sim NFp \ \& \ \sim N\sim Fp) \rightarrow (\mathbf{DefTF}p \vee \mathbf{DefFF}p)]$ | [from AD5 by PD2] |

To recap: if the principle of retrospective truth is valid, then—given the validity of the principle (TDF), according to which if in a situation s a proposition p is true, then in s it is definitely the case that p is true—the principle of retrospective definite truth is also valid. However, if the principle of retrospective definite truth is valid, then Definiteness Gappism is false and, hence, Definite Futurism is true.

Since determinacy gappists uphold that the principle of retrospective truth is valid in their theory, they cannot take determinacy simply to be what I am here calling definiteness and, hence, they must both commit themselves to the truth of Definite-Futurism and provide an adequate account of what indeterminacy amounts to in their theory.

4 Determinacy Gappism: ungroundedness and indeterminate grounding

Patrick Greenough (ms) has proposed a truthmaker/truthmaking gap theory of indeterminacy according to which

(TG1) A proposition p is *indeterminate* in truth-value, if and only if, either p is true and ungrounded or p is false and ungrounded

where, roughly

(GR1) A proposition p is *ungrounded* if, and only if, either there is nothing to make p either true or false or its truth-value does not supervene upon what things there are and how things are.

A future-contingent proposition p is, thus, indeterminately true or false for Greenough, if p is true but there is nothing in reality to ground its truth-value. Therefore, it appears that for Greenough, for every future-contingent proposition p , there *is* something more specific than ‘ p is either true or false’ that could—at least in principle—be asserted about p . But if p is true/false, then its being true/false is *ungrounded*—a brute fact that does not depend in

any sense on how reality is. There is indeed something weird in asserting ‘*p* is true’: being ungrounded, *p*’s truth-value is—for Greenough—metaphysically unknowable and therefore one could claim that asserting *p* violates the norm of assertion according to which one should assert that *p*, only if *p* is metaphysically unknowable. However, if *p* is a future-contingent statement and one asserts that *p* she is not thereby committing the mistake one would commit were Definite True-Futurism false.

Within Barnes and Cameron’s (henceforth: ‘B&C’) proposal, the idea is that the openness of the future amounts to a case of ontic indeterminacy. The future *does* exist, but it has gaps and fuzzy areas, as it were. Suppose, for instance, that it is settled today that Socrates will exist tomorrow (at *t*) but that it is open whether he will be sitting or standing. For B&C, the fact that it is unsettled today whether Socrates will be sitting or standing at *t* depends on the fact that reality itself is indeterminate as to what Socrates is doing at *t*. Reality itself is like a blurry picture from which it is impossible to make out whether Socrates is sitting or standing at *t*. The fact that reality itself is blurry, entails that there are many possible precise representations of reality that can consistently fill its gaps and holes, although no one—being they all ‘over-precise’—can be taken to be a faithful picture of how it really is (that is: indeterminate). According to all representations, it is either true or false that Socrates is sitting tomorrow—and so it is *determinately* the case that: either it is true that Socrates is sitting or it is false that Socrates is sitting—but only in some of them it is true that Socrates is sitting—and so it is neither determinately true that Socrates is sitting tomorrow nor it is determinately false that Socrates is sitting tomorrow.

Suppose that *Fp* stands for <Socrates will be sitting tomorrow> and let us, just for the sake of the argument, assume that propositions, if grounded, are grounded by *facts*. Since the future is a cloud of indeterminacy as to whether Socrates would be sitting or not tomorrow, it is correct to say that the fact that Socrates will be sitting today does not determinately exist. This means that the most precise fact about Socrates’ situation tomorrow that determinately exists is the fact that *either Socrates will be sitting tomorrow or Socrates will be*

standing tomorrow. Both the fact *f1* that Socrates will be sitting tomorrow and the fact *f2* that Socrates will be standing tomorrow exist only indeterminately (**Ind**:*p* stands for ' $\sim\text{Det}p \ \& \ \sim\text{Det}\sim p$ ')

$$(4) \quad \mathbf{IndExists}(f1) \ \& \ \mathbf{IndExists}(f2)$$

Clearly, however, it is determinately true that if *Fp* is grounded by something, it is grounded by *f1*

$$(5) \quad \mathbf{Det}[\text{Grounded}(Fp) \rightarrow \text{Grounds}(f1, Fp)]$$

Therefore, since *f1* exists only indeterminately, it follows that it is both false that it is determinately the case that *Fp* is grounded and that it is determinately the case that *Fp* is ungrounded:

$$(6) \quad \sim\mathbf{DetGrounded}(Fp)$$

$$(7) \quad \sim\mathbf{Det}\sim\text{Grounded}(Fp)$$

and, thus, that *Fp* is only indeterminately grounded:

$$(8) \quad \mathbf{IndGrounded}(Fp)$$

From what I have just said, it follows that the following appears thus to be one (if not the only) feasible option for B&C to combine Definite-Futurism within their theory of indeterminacy: instead of claiming—as Greenough does—that to be indeterminate in truth-value amounts to being ungrounded, they can claim that for a proposition *p* to be indeterminate is for it to lack *determinate grounds*, or, in other words, to be *indeterminately grounded*. We can understand the notion of a proposition being indeterminately grounded as follows:

- (IG) A true proposition p is *indeterminately grounded* if, and only if, the fact f that grounds the truth that p is such that f exists only indeterminately⁴

It seems thus that B&C can just simply replace TG1 and GR1 above with:

- (TG2) A proposition p is *indeterminate* in truth-value if and only if either p is true and indeterminately grounded or p is false and indeterminately ungrounded

where

- (GR2) A true(/false) proposition p is indeterminately ungrounded if, and only if either it is indeterminately the case that something makes p true(/false) or p 's truth-value indeterminately supervenes upon what things there are and how things are

Therefore, whereas Greenough's theory of indeterminacy is a theory of indeterminacy as *lack of grounding*, B&C's theory appears thus to be best understood as a theory of indeterminacy as *lack of determinate grounding*.

In section 3, I have argued that determinacy gappists are committed to Definite-Futurism. In this section I have shown how B&C can interpret the notion of indeterminate truth characterizing their theory by means of the notion of indeterminate grounding. This entails that true-futurists can happily accept both Greenough's and B&C's kind of determinacy gappism, since—given the validity of Definite-Futurism—the only way to make sense of their theories is that of taking them not as theories about the *truth-status* or what we might call the *definiteness-status* of future-contingent statements, but as views about their *grounding-status*. In other words, Greenough's and B&C's proposals can, therefore, be seen as dealing only with the problem of what grounds the truth-value of future-contingent statements, without jeopardizing the idea that future-contingent statements are either definitely true or definitely false.

⁴ Incidentally, this view appears to be very close to the one upheld by Cameron (2010) in his paper on truthmaking and presentism.

I conclude, therefore, that Determinacy Gappism is perfectly compatible with True-Futurism both in Greenough's and B&C's version.

5 MacFarlane

John MacFarlane's (2008) case is slightly more difficult to assess. As a matter of fact, in his *Truth in the Garden of Forking Paths* he defines a 'determinate truth' predicate only for the supervaluationist theory (which he then criticizes) as follows:

[Fo]r those supervaluationists who do think that a proof of unsettledness should compel withdrawal of an assertion about the future, there is an easy solution. We can introduce a 'determinate truth' predicate:

- (47) 'DetTrue' applies to x at a point of evaluation $\langle c, w \rangle$ if, and only if, x is a proposition and x is true at every world $w' \in W(c)$.

Using this predicate, our speakers can correctly characterize propositions whose truth is still unsettled as 'not Determinately True'. Whether they take a proof of unsettledness to compel withdrawal of an assertion about the future will then depend on whether they think retraction is required by a proof that the assertion is not Determinately True. (MacFarlane, 2008: 97)

However, as we have seen in chapter 2, MacFarlane also claims that the introduction of an actuality operator within his relativist theory requires the introduction of a context-of-assessment parameter in the points of evaluation. In that case, we have then two possible choices for the 'determinate truth' predicate:

- (DT1) 'DetTrue' applies to x at a point of evaluation $\langle c_u, c_a, w \rangle$ if, and only if, x is a proposition and x is true at every world $w' \in W(c_u)$.

(DT2) ‘DetTrue’ applies to x at a point of evaluation $\langle c_u, c_a, w \rangle$ if, and only if, x is a proposition and x is true at every world $w' \in W(c_u | c_a)$.⁵

Suppose now that today (in the context $c2$) it is a sunny day and we assess an utterance of ‘it is determinately true that it will be sunny tomorrow’ made yesterday (in the context $c1$). It is easy to see that, within MacFarlane’s relativist theory, the sentence

(9) It is determinately true that it will be sunny tomorrow

uttered in $c1$ and assessed in $c2$ turns out to be *false* according to DT1 and *true* according to DT2. However, in both cases it is true to say today (in $c2$, which is also taken as context of assessment) that

(10) What I said yesterday was determinately true

referring to what I said yesterday by uttering (9).

Given any two contexts $c1$ and $c2$, such that $c2$ is one day later than $c1$, and any future-directed sentence S uttered in $c1$, one of the main *desiderata* of MacFarlane’s relativist theory appears to be the validity of the following principle

(11) If with respect to $\langle c2, c2 \rangle$ (that is: taking the context $c2$ both as the context of utterance and of assessment) the sentence ‘What I said yesterday [in the context $c1$] by uttering S was true’ is true, then S is true with respect to $\langle c1, c2 \rangle$ (that is: taking $c1$ as the context of utterance and $c2$ as the context of assessment)

As a matter of fact, it would seem to be very odd for a relativist to claim that

(12) What I said yesterday by uttering S was true, even if my utterance was not true

⁵ See chapter 2 for the meaning of the symbolism.

However, if DT1 is taken as the correct definition of ‘DetTrue’ within a relativist framework, then it follows that it is true to say in *c*2 (and from the point of view of *c*2) that

- (13) What I said yesterday by uttering *S* was determinately true, even if my utterance of ‘It is determinately true that *S*’ was not true

Although there is a certain asymmetry between (12) and (13), I take it that the falsity of (12) should intuitively point to the falsity of (13) and, hence, to the rejection of DT1.

Returning now to the main point under discussion, we have that an argument parallel to the argument mounted against MacFarlane in chapter 3 can be made here against his novel determinacy gappist proposal. Being his novel proposal a kind of determinacy gappism, MacFarlane should uphold the thesis that

- (14) Future-contingent statements are neither determinately true nor determinately false

However, in order to be able to state the full modal force of his version of determinacy gappism and claim that (at least in some sense of necessity) it is *necessary* that future-contingent statements are neither determinately true nor determinately false, he must introduce in the object-language operators capable of shifting both the context of utterance and the context of assessment. As a matter of fact, the thesis that *if a statement *p* is historically contingent, then it is neither determinately true nor determinately false* is not guaranteed to hold for any <context of use, context of assessment> pair, but only when the context of use and the context of assessment *coincide* (such thesis is, in other words, only *diagonally valid*). In other words, in order to make his philosophical thesis not ineffable within the object-language, MacFarlane needs some special operators to be able to say things like

- (15) *From the point of view of today*, it was indeed correct to say yesterday that it is determinately true that it would be sunny today;

however, *from the point of view of yesterday*, it was instead correct to say it is neither determinately true nor determinately false.

As we have seen in chapter 3, however, it appears that MacFarlane is compelled to accept the soundness of the following argument:⁶

ARGUMENT G

- | | | |
|------|---|---------------|
| (G1) | It is sunny today | [premiss] |
| (G2) | In the deep future of <i>c1</i> , it is sunny the next day | [from G1] |
| (G3) | From the point of view of yesterday, ' <i>From the point of view of tomorrow it is true that it will be sunny tomorrow</i> ' was about the deep future of <i>c1</i> | [premiss] |
| (G4) | From the point of view of yesterday, ' <i>From the point of view of tomorrow it is true that it will be sunny tomorrow</i> ' was true if, and only if, in the deep future of <i>c1</i> it is sunny the next day | [from G3] |
| (G5) | From the point of view of yesterday, ' <i>From the point of view of tomorrow it is true that it will be sunny tomorrow</i> ' was true | [from G2, G4] |

However, it follows from (G5) that

- (G6) From the point of view of yesterday, it was true that from the point of view of today it would be true that it would be sunny today

and, given the validity of principle (TDF)

$$(TDF) \text{ [in-s]Tp} \rightarrow \text{[in-s]DefTp}$$

it follows from (G6) that

⁶ Cfr. argument G, chapter 2. I replace here 'm1' with 'c1' and 'S' with 'It will be sunny tomorrow'.

(G7) From the point of view of yesterday, it was *determinately true* that from the point of view of today it was true that it would be sunny today

which entails the falsity of determinacy gappism for *deep-future contingent statements*⁷ of the form ‘from the point of view of tomorrow, it is true today that it will be the case that *p* tomorrow’. But, as we have seen in chapter 2, the truth of gappism only with respect to superficial-future contingent statements is but a pyrrhic victory for gappists that, in fact, appears to be perfectly compatible with the very core of the true-futurist intuition.

I conclude, therefore, that also MacFarlane’s version of determinacy gappism poses no threat whatsoever to True-Futurism.

6 Conclusion

In this chapter I have argued that future-contingent statements are either definitely true or definitely false, a qualified true-futurist position that I have dubbed ‘Definite-Futurism’. As a result, I have shown that the most plausible way to construe the position according to which future-contingent statements are neither determinately true nor determinately false (‘Determinacy Gappism’) is to take the relevant notion of indeterminacy in play to refer not to the truth-status of future-contingent statements, but to their grounding-status instead. I conclude, therefore, that Determinacy Gappism does not pose any threat to True-Futurism and that, to the contrary, it might be its best ally with respect to the challenge posed by the grounding principle.⁸

⁷ See chapter 2.

⁸ See chapter 1 and 8.

Chapter 5

The logic of true futurism I—The problem of counterfactual evaluation

1 Introduction

I. According to *temporalists*, tense is to be analyzed by means of temporal operators such as ‘it was the case that’ and ‘it will be the case that’. For instance, a sentence like

- (1) It will be sunny in Paris

is parsed by temporalists as

- (2) It will be the case that [it is sunny in Paris]

Where [it is sunny in Paris] is thought as a present-tense proposition capable of having different truth-value at different times (it might for instance have been false yesterday and be true today). This entails that when it comes to provide the temporalist with an adequate semantics for tensed discourse, the central notion to be defined in the theory is the notion of *truth-at-a-temporal-point*. As a matter of fact, on the one hand we would like to have adequate semantic clauses for our temporal operators having the form

- (3) ‘It will be the case that *P*’ is true at a temporal point *k* if, and only if...
- (4) ‘It was the case that *P*’ is true at a temporal point *k* if, and only if...

On the other hand, we intuitively would want to define the notion of validity as truth at every temporal point (in every model) and the notion of logical consequence as truth-preservation at every temporal point (in every model).

II. *Open-futurists* claim that the future is *open* in some robust, objective, and metaphysical sense. Among open-futurists, *gappists* claim that if the future is open, future contingent statements are neither true nor false, *true-futurists* claim instead that they are either true or false, even if their truth value is not now-necessary or settled.

III. An idea that temporalist open-futurists might find appealing is that the best way to model the openness of the future is by means of what is customarily called a *branching structure*, that is a pair $\langle M, R \rangle$, where M is a non-empty set of moments and R is a irreflexive, antisymmetric, left-linear relation. Letting a ‘history’ be a maximal and linear chain of moments, a branching structure intuitively represents the tree of possible courses of history: all the possible ways the world might turn out to be in the future. Furthermore, this kind of models give an intuitive way to understand the notions of ‘historical possibility’ and necessity, thought of as truth in some possible history and truth in every possible history, respectively.

Here and in the following chapters I will be concerned with temporalist true-futurists upholding that the validity of the principle of bivalence for future contingent statements should be mirrored in temporal models by the presence of a single history marked as special, intuitively representing *the* way things will actually turn out to be, (what Belnap and Green (1994) and Belnap et al. (2001) have called the ‘Thin Red Line’—henceforth: ‘TRL’). In other words, temporalist true-futurists claim that:

- (i) The future is open in some robust, objective and metaphysical sense

- (ii) Future-contingent statements are either (definitely)¹ true or (definitely) false
- (iii) Tense discourse is to be analyzed by means of the temporal operators '*F*' ('it will be the case that') and '*P*' ('it was the case that'); atomic propositions are *priorean* propositions, i.e. propositions like <Socrates is sitting> or <it is raining in Paris> that can vary their truth-value over time.
- (iv) The openness of the future is to be modelled by means of *branching structures* of moments, i.e. pairs <*M*,*R*>, where *M* is a non-empty set of moments and *R* is a irreflexive, antisymmetric, left-linear relation.
- (v) The fact that future-contingent statements are either true or false corresponds on branching models to the presence of a Thin Red Line: a history marked as special, representing the way things will *in fact* turn out to be

Since this kind of true-futurists are temporalists, the central notion in their theory is that of *truth-at-a-temporal point* (for some kind of temporal point). However, as Belnap and Green (1994) and Belnap et al. (2001) have argued, providing true-futurists with an adequate definition of truth-at-a-temporal-point proves to be a more difficult task than it might appear at first sight. Briefly stated, the problem is that the most intuitive candidates for such notion appear to have the undesired consequence of either delivering the wrong predictions in specific scenarios or rendering intuitively valid principles governing tense discourse invalid.

The aim of this chapter is (i) to expose clearly what I will dub the *problem of counterfactual evaluation*, (ii) to consider the distinction that Belnap et al. put forward between *relative* and *absolute* Thin Red Line theories, (iii) to put forward two initially plausible TRL-theories that might seem to overcome the

¹ See chapter 4.

problem of counterfactual evaluation, and (iv), finally, to cast some doubts on their real efficacy. In the final part of the chapter I will introduce a general philosophical question for true-futurists which appears to be immediately relevant to the problem of counterfactual evaluation and argue that the two possible answers to that question divide the true-futurists' camp in two subgroups. The following chapter will be devoted to arguing that one of these position should be rejected as incompatible with the very spirit of True-Futurism. Finally, in chapter 7, I will return to the problem of counterfactual evaluation and expose two true-futurists theories—deploying the notion of an absolute and relative TRL, respectively—that meet all the *desiderata* for an adequate true-futurist theory.

2 Thin Red Line and the problem of counterfactual evaluation

Let us start considering first *linear* structures. A temporal model on a linear structure is a triple $\langle M, R_{\text{lin}}, V \rangle$, where M is a non-empty set of moments, V is a function from the set of moments to the power set of atomic propositions and R_{lin} is a linear relation on moments (see Figure 1).

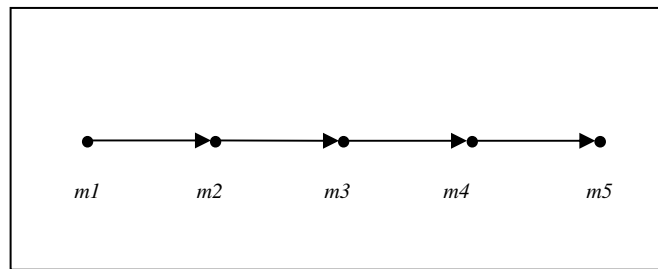


Figure 1

The recursive definition of the notion of truth-at-a-moment for Boolean connectives and temporal operators can be given as follows (where ‘ F ’ and ‘ P ’ are, respectively, the *future-tense* and the *past-tense* operator ‘It will be the case that’ and ‘It was the case that’):

(A1) p is true at m iff p belongs to $V(m)$ (for any atomic p)

(A2) ‘ $p \ \& \ q$ ’ is true at m iff p is true at m and q is true at m

- (A3) ' $\sim p$ ' is true at m iff p is not true at m
- (A4) ' $p \vee q$ ' is true at m iff either p is true at m or q is true at m
- (A5) ' $p \rightarrow q$ ' is true at m iff if p is true at m , then q is true at m
- (A6) ' Fp ' is true at m iff there is a moment m' such that $mR_{\text{lin}}m'$ and p is true at m'
- (A7) ' Pp ' is true at m iff there is a moment m' such that $m'R_{\text{lin}}m$ and p is true at m'

Clauses (A6) and (A7) should be intuitive enough. Consider as a matter of fact the toy-model depicted in Figure 2 (square balloons represent the value of the function V for the given moment; round balloons represent the notion of truth-at-a-moment)

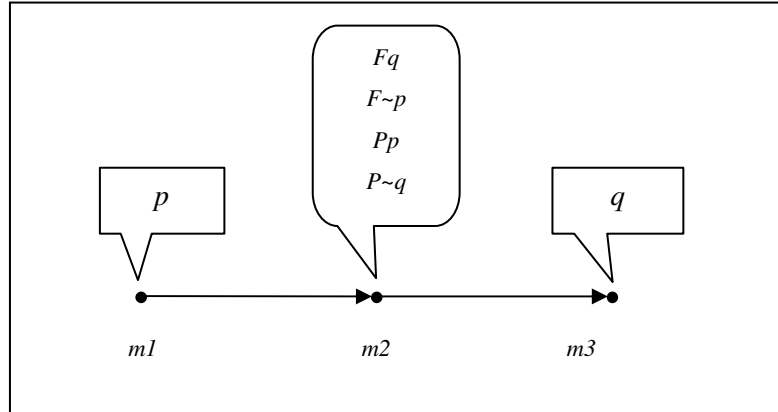


Figure 2

q belongs to $V(m3)$. Therefore, q is true at $m3$ (by A1). Hence, since $m3$ is later than $m2$, by (A6) it is also true at $m2$ that it will be the case that q (Fq). Similarly, p does not belong to $V(m3)$. Therefore, by (A1) p is not true at $m3$. Hence, since $m3$ is later than $m2$, by (A6) it is also true at $m2$ that it will be the case that $\sim p$ ($F\sim q$).

A *branching* model with a Thin Red Line is a 4-tuple $\langle M, R_{\text{br}}, \text{TRL}, V \rangle$, where the earlier-later relation R_{br} orders the set of moments in a tree-like fashion and TRL is a single history on the tree marked as special, intuitively representing the history that will in fact obtain (see Figure 3).

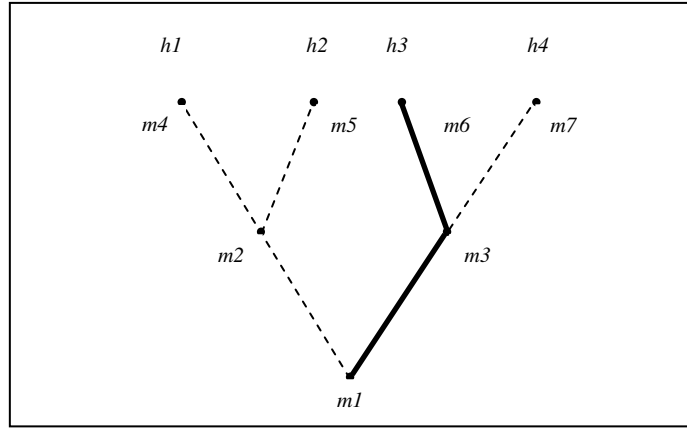


Figure 3

In the branching case the translation of the clause for the future-tense operator given in (A6) would appear as follows:

(A6') ' Fp ' is true at m iff there is a moment m' such that $mR_{br}m'$ and p is true at m'

However, it is easy to see that (A6') is not adequate in this case. As a matter of fact, (A6') dictates that 'It will be the case that p ' is true at a moment m if (and only if) there is a moment m' such that p is true at m' and m' is ' R_{br} -later' than m (henceforth, I will simply use 'earlier' and 'later' to refer to the R_{br} -relation). But in a branching model there can be different moments later than m , lying on different histories, and differing as to the truth-value of p . In this situation (A6') would predict that, at m , it is both true that it will be the case that p and that it will be the case that $\sim p$, which is surely an unwanted result (see Figure 4).

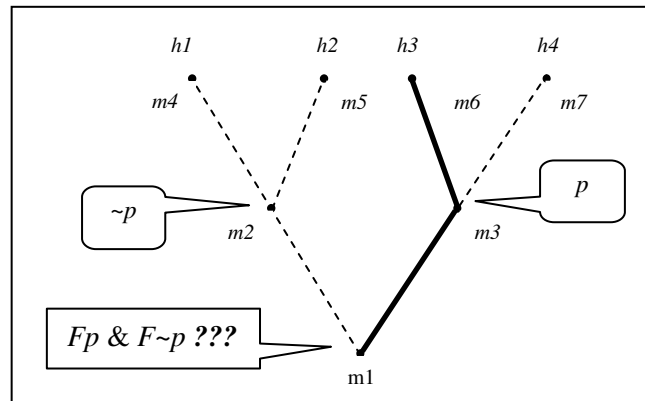


Figure 4

How can we then provide an adequate semantics for the future-tense operator in a branching setting with a Thin Red Line? Consider again figure 4. The future of $m1$ appears to be open as to whether it will be the case that p : at $m2$, p is not the case, whereas p obtains at $m3$. However, $m3$ lies on the Thin Red Line, which is supposed to represent the way things will in fact turn out to be. Therefore, Fp should come out true at $m1$ (even if ‘unsettled’ or ‘historically open’). This train of thought seems to suggest the following clause for the future-tense operator:

(A6'') ‘ Fp ’ is true at m iff there is a moment m' such that: (i) $mR_{br}m'$; (ii) m' belongs to TRL; (iii) p is true at m'

According to (A6'') ‘ Fp ’ is indeed true at $m1$, since there is in fact a moment m' later than m , belonging to the TRL and such that p is true at it. Consider, however, the following model (Figure 5):

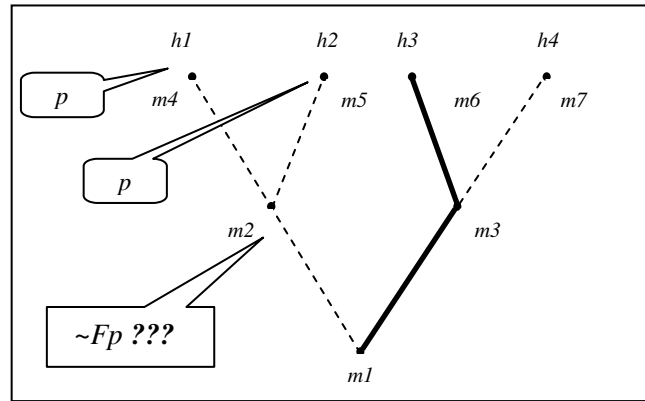


Figure 5

p is true in every possible future of $m2$. Intuitively, this should mean that it is *settled* at $m2$ that p will obtain² and, hence, that it is true at $m2$ that it will be the case that p . Nevertheless, (A6'') predicts in fact that ‘ Fp ’ is false at $m2$, since—given that $m2$ does not belong to the TRL—there is no moment m' that is both later than $m2$ and belongs to the TRL.

The history marked as the Thin Red Line is supposed to represent the way things will *in fact* turn out to be. Therefore, the histories not marked in red

² Intuitively, it is settled at a moment m that it will be the case that p if, and only, if in every possible future of m p will be the case.

represent what we might call *counterfactual histories*. In the same way, the moments not belonging to the TRL can be seen as *counterfactual moments*. For this reason, the problem highlighted in figure 5 can be called the ‘problem of counterfactual evaluation’, which can be framed more precisely as follows:

Given a branching model with a TRL, how are sentences to be evaluated at moments lying off the Thin Red Line?

The problem of counterfactual evaluation has been first presented by Belnap and Green (1994) and Belnap et al. (2001). Before pronouncing their final verdict on TRL theories, however, Belnap et al. (2001) try, on behalf of the TRL-theorist, to add some epicycles to the theory in order to see whether there is some way to salvage the very idea of a TRL in the open future. Their analysis is very detailed and subtle, but for the purpose of this chapter it will be sufficient to consider the main manoeuvre they consider the TRL-theorist to be in position to make. The idea is very simple: in order to cope with counterfactual evaluation, the TRL-theorist can claim that the TRL is not *absolute*, but instead only *relative* to moments. Instead of having a single history in the model marked as red, we have a function *trl* such that for any moment *m*, *trl(m)* is the Thin Red Line of *m*.³

Figure 6 gives an example of branching model with a relative Thin Red Line:

³ The following appear to be two intuitive constraints on *trl*:

$$(TRL1) \quad m \in trl(m)$$

$$(TRL2) \quad (m1 < m2 \wedge m2 \in trl(m1)) \rightarrow trl(m1) = trl(m2)$$

In this paper I will simply assume (TRL1) and (TRL2) to be the adequate constraints on the *trl*-function in a relative TRL framework. For a discussion on this see Belnap & Green (1994), Belnap et al. (2001), Bräuner et al. (2000) and Øhrstrøm (2009).

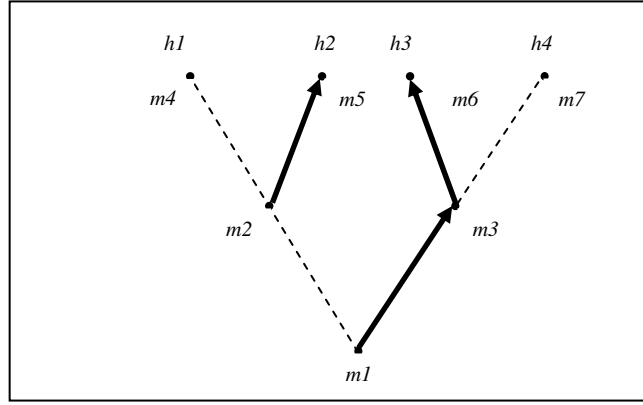


Figure 6

In a relative Thin Red Line framework (henceforth ‘R-TRL’), the following seems to intuitively be the right semantics for the future-tense operator:

(A6''') ‘ Fp ’ is true at m iff there is a moment m' such that: (i) $mR_{br}m'$; (ii) m' belongs to $trl(m)$; (iii) p is true at m'

Consider in fact the following model (Figure 7):

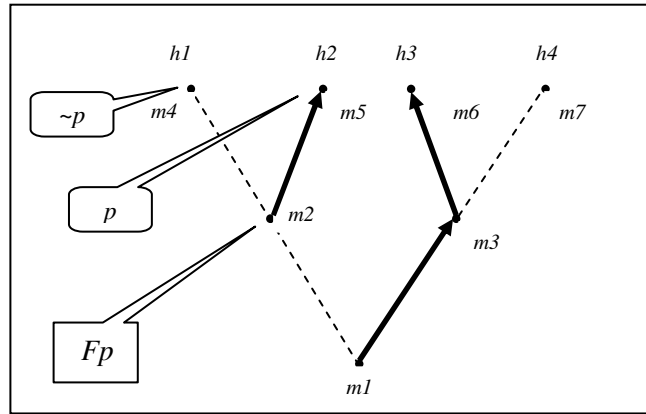


Figure 7

‘ Fp ’ is a future-contingent proposition at $m2$, since in some possible future of $m2$ p is true ($m5$) and in some other ($m4$) is false. However, $m5$ lies on the R-TRL of $m2$. This means that $m5$ represents the way will in fact turn out to be in the future of $m2$. (A6''') rightly predicts that ‘ Fp ’ (although unsettled) is true at $m2$.

A relative TRL plus (A6''') seems thus to adequately solve the problem of counterfactual evaluation: on the one hand, future-tense statements are to be evaluated with respect to the relative TRL of the moment in question; on the other hand, every moment is guaranteed by definition of having a history marked as 'its own' actual history.

Unfortunately, a serious problem lurks also for this type of relative TRL (henceforth: 'R-TRL') theory. Consider in fact the following model (Figure 8):

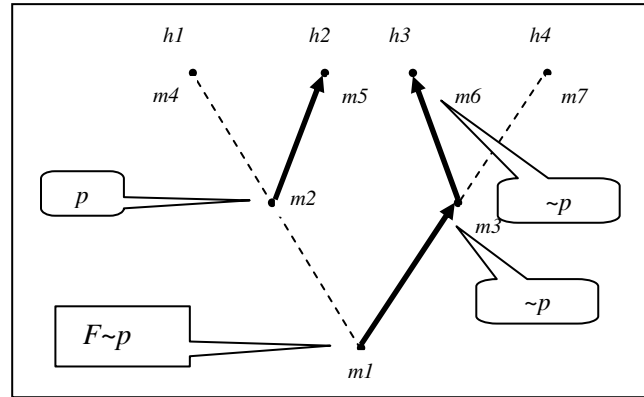


Figure 8

Since also in this framework (as in any kind of branching setting) every moment m has a unique past, the clause for the past-tense operator can be obtained simply by modifying (A7) as follows

(A7') ' Pp ' is true at m iff there is a moment m' such that $m'R_{br}m$ and p is true at m'

With (A7') in play it is then easy to see what is the problem with this kind of R-TRL. The model depicted in figure 8 is in fact a counter-model to the following principle:

(PF) $p \rightarrow PFp$

As a matter of fact, p is true at $m2$ but, given that ' $F\sim p$ ' is true at $m1$ and that $m1$ is the only moment earlier than $m2$, we have by (A6''') and (A7') that ' PFp ' is false at $m2$. But (PF) appears intuitively to be a *valid* principle: if I am running now then it was the case that I would be running now. Notice that this is different from saying that it was *necessary* or *settled* that I would be running

now. Furthermore, (PF) is intimately connected to what MacFarlane (2003, 2008) calls the ‘determinacy intuition’, i.e. the intuition that if it is now raining and yesterday I uttered the sentence ‘It will be raining tomorrow’ it is correct to say that what I said yesterday is true.

It might be replied that, although seemingly intuitive, it is perhaps a peculiar feature of the open future that principles like (PF) fail to be valid. Within branching settings, one might continue, one has to expect that things might become a bit weirder than in linear ones, given that in the former case temporal operators seem to get inextricably entangled with modality.

I am not at all convinced either that temporality and modality get inevitably and inextricably entangled in the open future, nor that with dealing with branching structures we should be more relaxed as to our intuitions about temporal statements and accept lightly odd failures of intuitively valid principles. I think that since principles like (PF) *appears* in fact to be deeply entrenched with our understanding of time and tensed discourse, we should—*ceteris paribus*—do all is possible to safeguard their validity and reject them only if absolutely necessary.

However, the real problem for the R-TRL framework we are now discussing is not much the fact the (PF) fails, but the *specific* way in which it fails. As a matter of fact, the R-TRL theory just sketched above compels us to accept something actually *worse* than the simple failure of (PF). Since ‘ $F\sim p$ ’ is true at $m1$ in figure 8, it follows not only that ‘ PFp ’ is false at $m2$, but also that ‘ $PF\sim p$ ’ is true. In other words, it is both true to say at $m2$ that p is the case and that it was the case that $\sim p$ would be the case. This means that substituting p with ‘the coin lands tails’ and supposing that at $m3$ $\sim p$ is true because the coin lands heads at $m3$, this theory predicts that it is correct at $m2$ to say

- (5) The coin came up heads, but this is not what was going to happen.
The coin was going to come up tails. It’s just that it didn’t⁴

(5) strikes me as extremely odd. In fact, those who contend the validity of (PF) are normally thinking that (PF) fails because even if it is today true that the coins lands tails, yesterday it was *neither true nor false*. Those who reject (PF)

⁴ Belnap and Green (1994, p. 380)

do so, in other words, because they believe that a future contingent statement like ' Fp ' can change its truth-status relative to a certain moment from *indeterminate* (or *neither true nor false*) to either *true* or *false*. However, setting aside cases of non-Ludovician time travel (see van Inwagen 2010), claiming that future contingent statement like 'The coin will land tails' can change their truth-status with respect to a moment m from being *false* at m to being *true* at m (or vice versa) is, I submit, a bullet nobody would want to bite.

For future reference, let us dub the (absolute and relative) TRL-theories presented in this section—corresponding to the clauses (A6'), (A6'') and (A6'''), respectively—*naive TRL-theories*.

3 Aristotle, Ockham and TRL

The last naive R-TRL theory just reviewed in the last section makes use only of a notion of truth relative to moments. However, in the *ockhamist logic* firstly put forward by Prior (1967), truth is relativized both to a *moment* and to a *history*, as follows (' \Box ' is the 'historical necessity' operator):

- (B1) p is true at $\langle m, h \rangle$ iff p belongs to $V(m)$ (for any atomic p)
- (B2) ' $p \ \& \ q$ ' is true at $\langle m, h \rangle$ iff p is true at $\langle m, h \rangle$ and q is true at $\langle m, h \rangle$
- (B3) ' $\sim p$ ' is true at $\langle m, h \rangle$ iff p is not true at $\langle m, h \rangle$
- (B4) ' $p \vee q$ ' is true at $\langle m, h \rangle$ iff either p is true at $\langle m, h \rangle$ or q is true at $\langle m, h \rangle$
- (B5) ' $p \rightarrow q$ ' is true at $\langle m, h \rangle$ iff, if p is true at $\langle m, h \rangle$, then q is true at $\langle m, h \rangle$
- (B6) ' Fp ' is true at $\langle m, h \rangle$ iff there is a moment m' belonging to h such that $mR_{br}m'$ and p is true at $\langle m', h \rangle$
- (B7) ' Pp ' is true at $\langle m, h \rangle$ iff there is a moment m' belonging to h such that $m'R_{br}m$ and p is true at $\langle m', h \rangle$

- (B8) ‘ $\Box p$ ’ is true at $\langle m, h \rangle$ iff for every h' such that m belongs to h' , p is true at $\langle m, h' \rangle$

The ockhamist definition of the future tense gives, however, rise to a problem. According to (B1)-(B8), a moment m is not sufficient to determine the truth-value of Fp : an assignment to the history parameter is needed. But: which history is to be chosen, amongst all the possible futures of m ? We can call this the problem of the *prima facie assignment*.

Thomason’s (1970) ‘aristotelian’ solution to the problem of the *prima facie assignment* is that of taking *all* the possible futures of m to be relevant, and to define accordingly the notion of sentence-truth/falsity at a moment m as truth/falsity at every *point of evaluation* $\langle m, h \rangle$ such that h is an history passing through m :

- (6) S is true at m iff S is true at $\langle m, h \rangle$, for every h passing through m ;
 S is false at m iff S is false at $\langle m, h \rangle$, for every h passing through m ;
otherwise, S is neither true nor false at m .

This definition allows for truth-value gaps, taking thus seriously and accommodating what MacFarlane (2003; 2008) has called the *indeterminacy intuition*, i.e. the intuition that future contingent statements are neither true nor false.

What is of great interest of Thomason’s theory for the TRL-theorist is that while he uses Prior’s ockhamist notion of truth as relative to $\langle \text{moment}, \text{history} \rangle$ pairs to define Boolean, temporal and modal operators, he then defines on the basis of that a second notion of truth as *relative only to moments*.⁵ This second notion is then used to define the notions validity and logical consequence. In other words: although Thomason theory uses a doubly relativized notion of truth to both moments and history, its *central* notion remains a notion of truth as relative only to moments. The same kind of manoeuvre appears to be available also to both relative- and absolute-TRL theorists.

⁵ In his aristotelian setting this is achieved by letting the moment parameter ‘quantifying out’ (see Belnap 2009) the history parameter.

3.1 Relative TRL theory

The R-TRL theorist can simply retain the ockhamist clauses (B1)-(B8), and then define the notion of sentence-truth at a moment as follows:

$$(7) \quad S \text{ is true at } m \text{ iff } S \text{ is true at } \langle m, trl(m) \rangle$$

According to (2), for a sentence S to be true at m is for S to be true at m and the *Thin Red Line* of m . Since for the R-TRL theorist any moment m has its own TRL, this definition appears to be intuitively correct. Furthermore, it makes (PF) valid.⁶ We might dub this theory ‘ockhamist R-TRL theory’ (or ‘OR-TRL’ for short).

Although they do not define explicitly the notion of truth at a moment, this solution appears faithful to the spirit of the R-TRL theory proposed by Bräuner et al. (2000) and Øhrstrøm (2009). The particular kind of R-TRL I am proposing here, however, differs from their theory in a crucial point: whereas I take (B8) to be the correct definition of historical necessity, Bräuner et al. (2000), Øhrstrøm (2009) and Øhrstrøm and Hasle (2011) prefer the following clause:

$$(8) \quad \text{‘}\Box p\text{’ is true at } \langle m, h \rangle \text{ iff for every } h' \text{ belonging to } C(m), p \text{ is true at } \langle m, h' \rangle$$

where $C(m)$ is thought of as the set of future possibilities of m and is constrained as follows:

$$(9) \quad C(m) = \{ h \mid m \in h \ \& \ \forall m' [(m' \in h \ \& \ m' > m) \Rightarrow trl(m') = h] \}$$

This definition requires that every possible future history h of m is such that, for every moment m' , if m' is later than m and lies on h , then h is the TRL of m . It is easy to prove that (9) entails that the set of possible futures histories of a given moment m is such that there can be no pair of histories h and h' belonging to $C(m)$, such that h and h' pass both through some moment later

⁶ The proof is straightforward.

than m .⁷ I find this requirement highly implausible. Take, for instance, the moment $m1$ in figure 1: if $h1$ is a possible history of $m1$ (so that $h1 \in C(m1)$), why should that rule out the present (at $m1$) possibility that the next actual moment after $m2$ will be $m5$ (so that also $h2 \in C(m1)$)?

Øhrstrøm (2009) justifies the rejection of (7) with the idea that ‘new possibilities may show up’ in the future.⁸ This idea appears, however, to have some undesired consequences. Consider, for instance the following scenario: in the tree depicted in figure 1 $h1$ is the TRL of $m1$ and $m2$, $h2$ is the TRL of $m5$ and p is true only at $m5$. It follows from (9) that $h2$ does not belong to $C(m1)$, since: $m2$ is later than $m1$, $m2$ lies on $h2$ and $h2$ is not the TRL of $m2$. Let us assume that $m5$ is two time-units later than $m1$. Deploying thus the metric operators P_n and F_n (‘it was the case n time-units ago’; ‘It will be the case n time-units hence’) we can observe that the following is the case at $m5$:

$$(10) \quad P_2 F_2 p$$

However, given (8), also the following is true at $m5$:

$$(11) \quad P_2 \Box \sim F_2 p$$

which is equivalent to

$$(12) \quad P_2 \sim \Diamond F_2 p$$

From which (by &-introduction and the fact that P_2 agglomerates) we have

$$(13) \quad P_2 (F_2 p \ \& \ \sim \Diamond F_2 p)$$

i.e. that it was the case (two time-units ago) that it would be the case (two time-units hence) that p and that it was impossible that it would be the case (two time-units hence) that p . But $F_2 p \ \& \ \sim \Diamond F_2 p$ sounds as a plain

⁷ *Proof*: Assume for *reductio* that $m1 < m2$, $h1 \neq h2$, $h1 \in C(m1)$, $h2 \in C(m1)$, $m2 \in h1$ and $m2 \in h2$. Since $m2$ is later than $m1$ we have—from (9) and the fact that it belongs to $h1$ (a possible future history of $m1$)—that $trl(m2) = h1$. Similarly, from (9) and the fact that it belongs to $h2$, we have that $trl(m2) = h2$ and, hence, that $h1 = h2$. Hence, we have both that $h1 = h2$ and (by our initial assumptions) that $h1 \neq h2$. *Contradiction!* Therefore for every history h and h' belonging to $C(m)$, such that $h \neq h'$, there is no moment m' later than m such that m' belongs both to h and to h' . QED

⁸ See Øhrstrøm (2009, p. 30).

contradiction! As a matter of fact, if \Box is to represent the settledness, it surely must be factive:

$$(14) \quad \Box p \rightarrow p$$

so that (13) should entail

$$(15) \quad P_2 \sim F_2 p$$

and hence (from (12), by $\&$ -introduction and P_2 -agglomeration)

$$(16) \quad P_2(F_2 p \ \& \ \sim F_2 p)$$

I conclude, therefore, that (7) is to be preferred to (10) and, consequently, that the OR-TRL theory just sketched above is superior to the theory put forward by Bräuner et al. (2000) and Øhrstrøm (2009).

3.2 Absolute TRL-theory

The absolute TRL (henceforth ‘A-TRL’) theorist needs only to take Thomason’s supervaluationist definition of sentence-truth at a moment and modify it as follows:

$$(17) \quad \begin{aligned} &S \text{ is true at } m \text{ iff } S \text{ is true at } \langle m, h \rangle, \text{ for every } h \text{ belonging to } fut(m); \\ &S \text{ is false at } m \text{ iff } S \text{ is false at } \langle m, h \rangle, \text{ for every } h \text{ belonging to } fut(m); \\ &\text{otherwise, } S \text{ is neither true nor false at } m. \end{aligned}$$

where fut is a function from the set of moments to the set $H(M)$ of all histories on the model such that:

$$(18) \quad \begin{aligned} &\text{if } m \text{ belongs to TRL, then } fut(m) = \{\text{TRL}\} \\ &\text{if } m \text{ does not belong to TRL, then } fut(m) = H(m) \end{aligned}$$

(where $H(m)$ is the set of all histories h , such that m belongs to h , i.e. the set of all histories that ‘pass through’ m). For any moment m , the function $fut(m)$ answers the question: which is the history h belonging to $H(m)$ —i.e. the set of histories passing through m —that represents the way things will in fact turn out

to be in the future of m ? If m is on TRL then the answer is determinate. If, on the other hand, m does not belong to TRL, the answer is indeterminate and such indeterminacy is reflected by the fact that the value of $fut(m)$ is not a singleton (as $\{TRL\}$), but the very set $H(m)$. Let this kind of A-TRL be the ‘supervaluationist A-TRL theory’ (or ‘SA-TRL’ for short).

4. Some worries

4.1 Truth-Value Links

The first problem for the TRL theories briefly sketched in the previous section is the failure of the so called *Truth-Value Links*.⁹ As a matter of fact, there appears to be a set of principles linking the truth-value of different temporal sentences at different temporal points that strike as being deeply entrenched in our understanding of tensed-discourse. One of these principles is the following:

(TVL) For every *temporal point* $k1$ and $k2$, such that $k2$ is later than $k1$, if p is true at $k2$, then ‘ Fp ’ (‘It will be the case that p ’) is true at $k1$

However, it is easy to see that both SA-TRL and OR-TRL fall short of TVL. As for SA-TRL, consider figure 9:

⁹ Dummett (1978). For a discussion see Wright (1986), Weiss (1996) and, more recently, Westphal (2004).

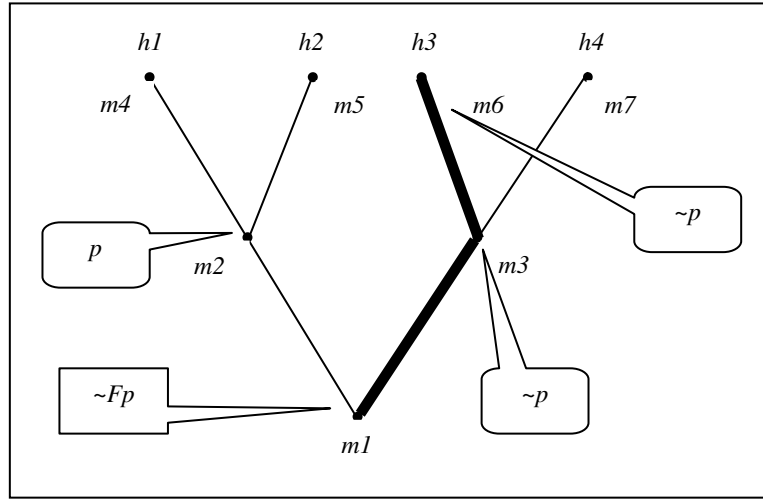


Figure 9

In this model we have by (7) both that p is true at $m2$ and that ' Fp ' is not true at $m1$, despite the fact that $m1$ is earlier than $m1$. As for OR-TRL, consider figure 10

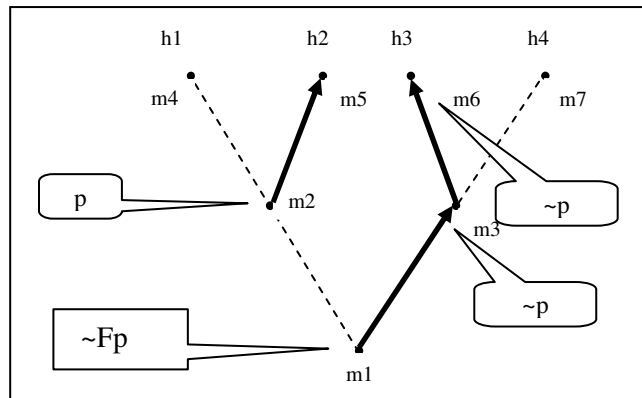


Figure 10

Even in this case we have by (8) that p is true at $m2$ and ' Fp ' is not true at $m1$.

(TVL) appears to be the meta-linguistic counterpart of (PF). Also in the case of (TVL) it must then be stressed that what troubles the TRL theories under consideration is not just its failure, but the *specific* way in which it fails. As a matter of fact, in the models depicted in figures 9 and 10 not only it is the case that (TVL) is false, but also that while p is true at $m2$, 'It will be the case that not p ' is true at $m1$. As in the case of (PF), detractors of (TVL) are in fact normally Aristotelians who admit that the it is possible for S to be true at

temporal point kI and for ‘WILL: S ’ to be neither true nor false at earlier temporal points.¹⁰ In our case, instead, ‘WILL: S ’ is false—and consequently ‘WILL: $\sim S$ ’ is true—at mI : a highly unintuitive result few would want to underwrite.

4.2 Counterfactual evaluation and counterfactuals of openness

The problem of counterfactual evaluation is the problem of how to evaluate future contingent statements at moments lying off the (absolute) TRL. Taking a moment m lying off the TRL and future-contingent statement Fp (with respect to m), the question is thus:

(Q1) What is the truth-value of ‘ Fp ’ at m ?

(Q1) is, in itself, a rather technical question concerning the notion of sentence-truth in our temporal models. However, the problem of counterfactual evaluation—which I have so far presented in its most technical dress—intuitively appears to point to a philosophically significant question, that is

(Q2) What would have been the truth value of ‘ Fp ’, were m to have belonged to the actual history?

or, alternatively:

(Q3) What would have been the truth value of ‘ Fp ’, had the circumstances represented by m obtained?

or, again:

(Q4) What would have been the truth value of ‘ Fp ’, were m to have been present?

The connection between (Q1) and (Q2-4) strikes as intuitively correct, on pain of the representational adequacy of the branching model itself. Given that moments on the branching tree are thought of as representing possible ways things might have turned out to be, asking about the truth-value of a sentence at

¹⁰ See, for instance, McCall (1966) and Halpin (1988) on the failure of (principles akin to) (TVL).

a given moment seems intuitively to be equivalent to asking what would have been the truth-value of the sentence in question, were that moment to have become actual/present.

Let us call ‘Truth-Value Counterfactuals’ (TVCs) counterfactuals of the form

(TVC) If m had obtained, S would have been true/false/neither-true-nor-false/either-true-or-false

where m is a merely counterfactual moment and S is a future-contingent statement with respect to m . What is the general relation between TVCs and the truth-value of the sentence S at the moment m ? The following principle appears to be valid:

(L1) If it is the case that [if m had obtained, then S would have been true/false/neither-true-nor-false/either-true-or-false], then S is true/false/neither-true-nor-false/either-true-or-false at m

As a matter of fact, if—as I suggested—asking about the truth-value of a sentence S at a given moment m is equivalent to asking what would have been the truth-value S , were m to have become actual/present, then it follows that to say, for instance, that if m had obtained, then S would have been true is simply to answer ‘the True’ to (Q2) and, hence, to claim that in our model S should be true with respect to m .

4.2.1 The inadequacy of SA-TRL

Given the validity of L1, it is easy to see that SA-TRL is inadequate as a theory for true-futurists. As a matter of fact, true-futurists upholds that future-contingent statements are bivalent not as a matter of mere fact, but as matter of *necessity*: what could it mean that future-contingent statements are actually bivalent but, had things gone otherwise, then future-contingent statements would have been gappy?¹¹ Therefore, for every counterfactual moment m and

¹¹ See chapter 3 on this point.

future-contingent statement Fp with respect to m , true futurists must be committed to the truth of the following counterfactual:

- (C1) Were the circumstances represented by m to have obtained, the future-contingent statement ' Fp ' would have been either true or false

However, for SA-TRL theorists a future-contingent statement ' Fp ' is *neither true nor false* with respect to a counterfactual moment m . Hence, it follows by (L1) that SA-TRL theorists must claim that

- (C1SA) Were the circumstances represented by m to have obtained, the future-contingent statement ' Fp ' would have been *neither true nor false*

contrary to our assumption. For this reason, I conclude that SA-TRL is not a feasible true-futurist theory.

4.2.2 Is OR-TRL an adequate theory? The problem of *Counterfactual True-Futurism*.

According to OR-TRL, for every moment m and sentence S either S is true at m or S is false at m . Therefore, OR-TRL is not in contradiction with (C2), and so manages to comply with what appears to be one of the minimal features of any possibly feasible true-futurist theory. However (and leaving aside for a moment the question related to the Truth-Value Links), a possible problem lurks also for OR-TRL theorists. As a matter of fact, not only for OR-TRL theorists, for every moment m and sentence S , it is true that *either S is true at m or S is false at m* , but it is also true that which truth-value S has with respect to m is *determinate*. In other words, for OR-TRL theorists it is also true that *either S is determinately true at m or S is determinately false at m* . As a matter of fact, for every sentence S and moment m there is, according to OR-TRL, a *determinate* answer to the question: 'what is the truth-value of S at m ?'. In order to appreciate what this entails, we have to finally understand what is the

general relation between TVCs and the notion of sentence-truth at a moment. Consider in fact the left-to-right version of L1

(L1-lr) If S is true/false/neither-true-nor-false/either-true-or-false at m , then it is the case that [if m had obtained, then S would have been true/false/neither-true-nor-false/either-true-or-false]

(L1-lr) cannot be correct. To see why, take the following counterfactuals

(C3) If the circumstances represented by m had obtained, then ' Fp ' would have been true

(C4) If the circumstances represented by m had obtained, then ' Fp ' would have been false

(C3) and (C4) appear to be the counterparts, in an open future setting, of the so-called 'counterfactuals of freedom' (COFs) in the debate on Molinism. I shall thus call them *counterfactuals of openness* (COPs). Independently of any specific purported logic for true-futurism (SA-TRL, OR-TRL etc), the question about whether there are true COPs is a question capable in principle to divide the true-futurists' camp into two distinct kinds of true-futurist theories that we might call *Factual* ('there are no true COPs') and *Counterfactual True-Futurism* ('there are true COPs'). Not only Factual True-Futurism appears to be a real option for true-futurists, but there appears also to be something immediately counterintuitive about Counterfactual True-Futurism. As a matter of fact, if the future of a counterfactual moment m is open, it seems to be at least prima facie intuitive to say that (C3) and (C4) should turn out false. It would, in fact, seem very odd to say things like

(C5) If the circumstances represented by m had obtained, the future would have been open as to whether ' Fp ' would have been true or not. Nevertheless, in that case, ' Fp ' would have been true

or, even worse

(C6) If the circumstances represented by m had obtained, no entity existing at m , nor any state of affairs then obtaining would have

been sufficient to settle the truth-value of ' Fp '. Nevertheless, in that case, ' Fp ' would have been true

However, if we assumed the validity of (L1-lr), then Factual True-Futurism would be as such an inconsistent theory, since the falsity of both (C3) and (C4) would entail, by contraposition on (L1-lr), that ' Fp ' is neither true nor false at m , which would be inconsistent with (C1). Notice that from (L1-lr) and (L1) it follows that

- (19) It is not the case that if m had obtained, then S would have been true

entails that

- (20) If m had obtained, then S would have been untrue

which seems to be a bad result. What (L1-lr) leaves unrightfully out of the picture is, in fact, the possibility that the truth-value of a sentence S at a counterfactual moment m is *indeterminate*. One might in fact say that although S is determinately either true or false at m , *it is neither the case that S is determinately true at m nor that S is determinately false at m* , which appears to be exactly what factual true-futurists should say by denying that either (C3) or (C4) is true. As an example, consider the following three counterfactuals:

- (21) If I had tossed a coin, it would have landed either heads or tails
(22) If I had tossed a coin, it would have landed heads
(23) If I had tossed a coin, it would have landed tails

In normal circumstances (the coin is fair, etc) it would seem natural to say that while the first counterfactual is true, the last two are false:

- (24) Although it is the case that, if I had tossed a coin, it would have landed either heads or tails, it is both not the case that if I had tossed a coin, it would have landed heads and that if I had tossed a coin, it would have landed tails

However, this seems to be just equivalent to say that the outcome of my possible toss is *indeterminate* or, in other words:

- (25) The outcome of my possible toss is *determinately* either heads or tails, but it is *indeterminate* whether it is heads or tails

that is

- (26) It is neither *determinately* the case that the outcome of my possible toss is heads nor it is *determinately* the case that the outcome of my possible toss is tails

If this is correct, we can then state the general relation between TVCs and the notion of sentence-truth at moment as follows:

- (LINK) It is the case that [if m had obtained, then S would have been true/false/neither-true-nor-false/either-true-or-false] if, and only if, S is *determinately* true/false/neither-true-nor-false/either-true-or-false at m

Given that, intuitively, determinate truth entails plain truth

- (27) If it is determinately true that p , then it is true that p

it follows that if both (C3) and (C4) are untrue, then, by LINK, Fp is neither determinately true at m nor determinately false at m . However, since for true-futurist (C2) is true it follows, by LINK, that for any true-futurist it is determinately the case that S is either true or false at m .

We are now finally in the position to ask ourselves whether OR-TRL is a feasible true-futurist theory. The answer is that such a question simply boils down to the question whether Counterfactual True-Futurism is a feasible and consistent version of True-Futurism. As a matter of fact, an immediate consequence of LINK is that OR-TRL entails Counterfactual True-Futurism. According to OR-TRL, for every sentence S and moment m

- (28) Either S is determinately true at m or S is determinately false at m

from which and LINK it follows that, for every counterfactual moment m and future-contingent statement ' Fp ' with respect to m , either

(29) If m had obtained, then S would have been true

or

(30) If m had obtained, then S would have been false

is true, which is precisely the *counterfactualist* position.

5. Conclusion

In this chapter I have

- (i) discussed the 'problem of counterfactual evaluation',
- (ii) advanced two possible theories for its solution (SA-TRL and OR-TRL),
- (iii) dismissed SA-TRL as unfaithful to the very spirit of True-Futurism,
- (iv) briefly distinguished between what I have called 'Factual' and 'Counterfactual True-Futurism',
- (v) and argued that the question about whether OR-TRL is a feasible true-futurist theory depends on whether Counterfactual True-Futurism is really an option for true-futurists.

As I have briefly argued in the last section, Counterfactual True-Futurism has at least the ring of counter-intuitiveness to it. Nevertheless, I think that something more than the mere appeal to intuitions can be made to reject the idea of Counterfactual True-Futurism and, hence, the adequacy of OR-TRL as a possible true-futurist theory. As I shall argue in the following chapter, in fact,

if we accept some intuitive valid inference patterns for counterfactuals and the idea that ‘chancy’ counterfactuals like ‘If I had tossed the coin, it would have landed tails’ are, in normal circumstances, not true, then Counterfactual True-Futurism must be rejected. The upshot of my argument will then be that

- (i) also OR-TRL is not a plausible true-futurist theory
- (ii) therefore: no theory reviewed in this chapter solves the problem of counterfactual evaluation;
- (iii) complying with Factual True-Futurism is a necessary condition for any theory *T* to be a feasible candidate for True-Futurism.

Finally, in chapter 7, I will expose two adequate factual true-futurist theories that appear to comply with all the *desiderata* for a true true-futurist theory.

Chapter 6

Against Counterfactual True-Futurism

1. Introduction

1.1 Factual and Counterfactual True-Futurism

True-futurists maintain that, for every future contingent statement S , S is either true or false. This entails, in turn, that among all the possible histories ‘passing through’ the present moment a single history is ‘marked’ as *the* true history: the Thin Red Line (TRL). Consider then an arbitrary moment m lying off the TRL representing a merely possible way things could have turned out to be. According to true-futurists the principle of bivalence holds for future-contingent statements not as a matter of fact, but as a matter of necessity.¹ It is, in other words, necessary that, for every future-contingent statement S , either S is true or S is false. Given the highly-intuitive validity of the following principle governing the interaction between metaphysical necessity and counterfactuals²

(NC) From $\Box p$, infer $q \Rightarrow p$ (for any q)

it follows that any true-futurist should, as such, subscribe to the truth of the following counterfactual (where P is a future-contingent statement with respect to m):

- (1) If m had obtained, then P would have been either true or false
Obtain(m) \Rightarrow [True(P) or False(P)]

¹ See chapter 2.

² ‘ \Rightarrow ’ stands here for the counterfactual conditional (see section 1.3).

Consider, however, the following two counterfactuals:

- (2) If m had obtained, then P would have been true

$$\mathbf{Obtain}(m) \Rightarrow \mathbf{True}(P)$$

- (3) If m had obtained, then P would have been false

$$\mathbf{Obtain}(m) \Rightarrow \mathbf{False}(P)$$

Here, it seems, true-futurists face a choice. One might, in fact, ask whether one of those counterfactuals is true or whether, instead, both of them are false/not true. By analogy with the so-called ‘counterfactuals of freedom’ (COFs) in the debate on Molinism³ we might call counterfactuals as (2) and (3) *counterfactuals of openness* (COPs). The general question for the true-futurist becomes thus:

Are there true counterfactuals of openness?

This question gives rise to two possible positions for true-futurists that I shall call ‘Factual’ and ‘Counterfactual True Futurism’, respectively:

- (FTF) **Factual True-Futurism:** for every counterfactual moment m and sentence P such that P is future-contingent with respect to m both (2) and (3) are not true

- (CTF) **Counterfactual True-Futurism:** for every counterfactual moment m and sentence P such that P is future-contingent with respect to m , either (2) is true or (3) is true

While both factual and counterfactual true-futurists uphold that if m had obtained, then P would have been truth-valued, only counterfactual true futurists think that there is actually a fact of the matter as to which truth-value a future contingent statement P would have had, had m obtained. For future reference I shall call *Counterfactual Determinacy* and *Counterfactual*

³ For a recent discussion about Molinism and counterfactuals of freedom see, among others, Zimmerman (2009) and Merricks (2011). On the relation between Molinism and the notion of a Thin Red Line see Restall (ms.).

Indeterminacy the *phenomena* acknowledged by counterfactual and factual true-futurists, respectively.

1.2 Aim and overview

The aim of this chapter is to argue that CTF is false and that, therefore, there are no true COPs. The gist of my general argument against CTF will be the following:

CTF-theorists have the burden to put forward a general analysis of counterfactuals in the open future such as to (i) make some COPs true and (ii) respect the intuitive truth-value of ordinary counterfactuals. In particular, it appears that, intuitively, *chancy* counterfactuals like ‘If I had tossed a coin, it would have landed tails’ and ‘If I had tossed a coin, it would have landed heads’ should be predicted to be false. However, it is possible to argue that, in order for there to be true COPs and for *chancy* counterfactuals to be false, counterfactualists appear obliged to posit a mysterious kind of *correlation* between the relative true-futures of counterfactual moments, which appears to be in contradiction with the thesis that the future of counterfactual moments is indeed open. I will, therefore, conclude that CTF has to be rejected.

More in detail, I will proceed as follows:

- (i) In section 2 I shall briefly dismiss two possible strategies against counterfactualism based, respectively, on the duality of ‘would’ and ‘might’, and on the principle of grounding
- (ii) In section 3 I will begin discussing how counterfactualists can produce a general semantics for counterfactuals such that:
 - i. it is based on a relevant notion of similarity (as Lewisian orthodoxy mandates)

- ii. it is such as to make some COPs true
- iii. it respects our intuitions about ordinary counterfactuals and, hence, predicts ‘chancy’ counterfactuals like ‘If I had tossed the coin, it would have landed tails’ to be untrue

To this effect I will propose a first possible counterfactualist analysis for counterfactuals (‘AC1’) that seems to deliver the right results

- (i) In section 4 I will criticise AC1 on the grounds that it appears to posit a mysterious kind of ‘correlation’ among the thin red lines of merely counterfactual moments.
- (iv) In section 5, I will advance two new semantic analysis of counterfactuals (‘AC2’ and ‘AC3’) and then dismiss them as wanting. Finally, I will put forward a general argument—quite independent from any specific account for counterfactuals—showing that Counterfactual True-Futurism is inconsistent with some intuitively valid inference rules for counterfactuals

1.3 Notation

Before concluding this introductory section it may be useful to briefly overview the kind of notation I will be using. As usual, I shall be very relaxed about the use/mention distinction and let it be clear from the context whether a certain expression is used or mentioned.

- ‘ \Rightarrow ’ stands for the counterfactual conditional, so that ‘ $p \Rightarrow q$ ’ is to be read ‘if p had been the case, then q would have been the case’;
- ‘ $p \parallel \textit{might} > q$ ’ stands for ‘if p had been the case, then q might have been the case’;

- ‘N’ stands for the historical necessity operator ‘it is now historically settled that’;
- ‘ \Box ’ is the metaphysical necessity operator;
- throughout the paper I will often use ‘ $m \Rightarrow p$ ’ for an arbitrary COP. It is to be read ‘If the merely counterfactual moment m had obtained, then the future contingent statement p (with respect to m) would have been true’;
- in general, I will use ‘ m ’ both as a variable over moments, as a moment-parameter, and as shorthand for ‘the moment m obtains’. So, for instance, ‘ $\exists m(m \ \& \ \dots)$ ’ is to be read ‘There is a moment m such that m obtains and...’. The meaning of ‘ m ’ will be made clear from the context;
- in discussing the problem of ‘chancy’ counterfactuals, I will use ‘toss \Rightarrow heads’ and ‘toss \Rightarrow tails’ for ‘If I had tossed the coin, it would have landed tails’ and ‘If I had tossed the coin, it would have landed heads’. However, ‘ $m \Rightarrow$ tails’ and ‘ $m \Rightarrow$ heads’ will stand for ‘If the moment m had obtained, then ‘*The coin will land heads*’ would have been true’ and ‘If the moment m had obtained, then ‘*The coin will land tails*’ would have been true’.

Other expressions will be defined as I introduce them for the first time.

2. Two non-starters

2.1 Would/might duality

According to the thesis of *Counterfactual Openness*, the future of counterfactual moments is open, which is equivalent to saying that, for every

counterfactual moment m , there is some proposition p such that, if m had obtained, then it would not have been settled either that p or that $\sim p$:

$$(4) \quad m \Rightarrow (\sim Np \ \& \ \sim N\sim p)$$

using ' $p \parallel \text{might} > q$ ' for 'If p had been the case then it might have been the case that q ', it seems that (7) intuitively entails both

$$(5) \quad m \parallel \text{might} > p$$

$$(6) \quad m \parallel \text{might} > \sim p$$

However, according to Lewisian orthodoxy, the following principles hold for 'might' and 'would':

DUALITY:

From $p \Rightarrow q$, infer $\sim(p \parallel \text{might} > q)$

From $p \parallel \text{might} > q$, infer $\sim(p \Rightarrow q)$

However, from (8) and (9) and Duality we can infer both

$$(7) \quad \sim(m \Rightarrow p)$$

$$(8) \quad \sim(m \Rightarrow \sim p)$$

which contradicts CTF.

It appears hardly questionable that Counterfactual Openness entails—and is entailed by—the corresponding 'might'-counterfactuals. However, although this argument surely shows a clear tension between CTF and Duality (a tension that might well turn out to be fatal), I think that we had better look elsewhere for a *specific* argument against CTF as such. As a matter of fact, Duality is not a problematic principle only for counterfactualists, but for *open-futurists* (true-futurists and gappists) in general. Consider, in fact, the following argument:

ARGUMENT DU

(DU1) If I were to strike the match, it would be (historically) possible for it not to light [premiss]

(DU2) If I were to strike the match, it might not light [from DU1]

(DU3) It is not the case that, if I were to strike the match, it would light
[From DU2, by Duality]

If Counterfactual Openness does entail—as it is intuitively the case—the truth of the relevant might-counterfactuals, (DU1) entails (DU2) which, in turn, entails (DU3) by Duality. (DU1) is a claim to which open-futurists as such appears to be committed to. Surely, if the future is indeed actually open, my striking a match would not have settled it. At the same time, however, (DU3) surely appears to be a weird conclusion: we intuitively would like to say that if I had struck the match, it would have lit. Furthermore, the argument clearly generalizes to a vast range of ordinary counterfactuals, to the effect that, if argument DU is indeed valid, the startling conclusion is that most of the ordinary counterfactuals we employ in our everyday talk are false.

Furthermore, it is not even necessary to think that the future is open or that the universe is indeterministic to have problems with Duality. As a matter of fact, it seems that claims like (DU2) are true even if our universe is deterministic,⁴ and (DU2) is all we need to conclude—by Duality—that most ordinary counterfactuals are false.

In this chapter we are asking ourselves whether there are *specific* reasons for true-futurists to be committed to Factual True-Futurism and to reject the thesis that there are true counterfactuals of openness. Hence, the argument

⁴ ‘The antecedent of “if I were to jump, I would come down” is imprecise: I have not told you anything about the manner in which my hypothetical jump takes place, let alone given you a molecule-by-molecule specification of the jump. The antecedent, then, covers a huge range of initial conditions, each of which results in my jumping. Among them will be initial conditions that give rise to anomalous trajectories in which I vaporize, for the antecedent is too imprecise to rule them out. [...] So I If I were to jump, I might wind up on one of those anomalous trajectories. Thus, it is false to say [even in a deterministic universe] that if I were to jump, I would come down. I might not. (Hajek, ms.:21)

from Duality is too far-reaching to efficaciously to rule out counterfactualism as an option for true-futurists.⁵

2.2 Truthmakers

Roughly speaking, the *Truthmaking Principle* says that every truth has a truthmaker, that is that for every p , if p is true, then there is an entity x such that x makes p true, while the *Supervenience Principle* says that every truth supervenes on being, that is—roughly—that for every p , if p is true, then if p were false there would be either a difference with the actual population of entities or a difference with the actual pattern of instantiation of fundamental properties and relations. We can thus call the following the *grounding principle*:

GROUNDING:

For every p , if p is true is either truth-made or supervenient

Undoubtedly, the grounding principle has a certain intuitive appeal: truth—we appear to intuitively feel—must be grounded in reality, in one way or the other. However, as it happens with the counterfactuals of freedom in the debate on Molinism, it seems that once we accept the validity of the grounding principle a powerful argument against counterfactualism can be easily advanced. As a matter of fact, if there are true COPs, then they must be grounded in reality. But: what could possibly ground their truth? COPs are *about* what would happen, as a matter of *mere fact*, were another moment m to have obtained instead and so it seems that the way the present or actual state of the world has turned out to be should be utterly irrelevant to the truth-value of a COP. It appears, therefore, that there could be nothing to ground the truth of a COP. Hence, the argument concludes, there are no true COPs.

As appealing as this argument might appear at first sight, I think that it should also be left aside in the debate between Factual and Counterfactual

⁵ On the problems surrounding the duality of ‘would’ and ‘might’ see, among others: De Rose (1999), Hawthorne (2005), Williams (2008), Ichikawa (2011) and Hajek (ms.).

True-Futurism. The reason is simple: as we have seen in chapter 1, at least within some metaphysical frameworks the grounding principle can be troubling for true-futurists *as such*, and so it is unsuitable to separate the wheat of True-Futurism from its chaff.

I will, therefore, assume that counterfactualists have the option of simply rejecting the unrestricted validity of the grounding principle.

3. The counterfactualist analysis of counterfactuals

3.1 Similarity

According to the received view, counterfactuals are to be analyzed by means of a notion of *similarity*.⁶ Within a possible-worlds account for counterfactuals, the truth-conditions of a counterfactual of the form ' $p \Rightarrow q$ ' at a world w are usually given along the following lines (a ' p -world' is a possible world in which p is true):

- (9) ' $p \Rightarrow q$ ' is true at w if, and only if, some p -world in which q is true is more similar to the actual world than is any p -world where q is not true.

In our moments-and-histories based framework, it would appear that the most intuitive notion of similarity relevant to counterfactuals is (or at least involves) the similarity between *histories*.⁷ However, this kind of analysis appears to be incompatible with counterfactualism.

Consider a counterfactual moment m . By upholding the thesis that there are true COPs, the counterfactualist is committed to the thesis that a certain history h , belonging to the set $H(m)$ of histories passing through m is the true future or the relative actual history of m . Suppose then that the COP ' $m \Rightarrow p$ ' ('If the counterfactual moment m had obtained, then the future-contingent statement p —with respect to m —would have been true') is true. Since the

⁶ See Lewis (1973)

⁷ See, for instance, the recent work of Placek and Müller (2007) on this issue.

histories belonging to $H(m)$ are the only histories along which m obtains, it follows that according to the history-based similarity-account for counterfactuals the actual truth-conditions for ' $m \Rightarrow p$ ' should be the following:

- (10) ' $m \Rightarrow p$ ' is true if, and only if, some m -history in which p is true is more similar to the actual history than is any p -history where q is not true

However, CTF appears to be incompatible with (10), for at least two reasons:

- (i) First, it appears that, intuitively, the notion of similarity that would be involved in evaluating counterfactuals of the form ' $m \Rightarrow p$ ' should be such as *not to discriminate between the histories belonging to $H(m)$* . When we ask whether ' $m \Rightarrow p$ ' is true we consider the hypothetical scenario in which m is present and wonder whether, as a matter of mere fact, there is an history h , such that it is true to say that it is the history that would have obtained in that situation. However, we also think that the future of m is objectively open and, so, for every history h belonging to the set $H(m)$ of histories passing through m , it is *possible* with respect to m that h obtains. Hence, with respect to historical possibility, all histories belonging to $H(m)$ are *on a par* since—despite the fact that some histories might be less likely to obtain with respect to others—each of them is as historically possible as any other, which should be the only thing that matters in the evaluation of COPs.
- (ii) Second, the counterfactualist does not seem to want to say that a certain history h that is the relative thin red line of the counterfactual moment m *because* h is the most similar history to the actual one among all the histories passing through m . The identity of the true future of m should in fact be *independent* from the identity of the actual history. It seems, in other words, to be part and parcel of True-Futurism that the identity of the true future of

any moment m , not only is not determined by what goes on at m , but *a fortiori* is also not correlated in any sense with the identity of the true future of other counterfactual moments in the branching tree of possibilities. Therefore, when we consider a counterfactual whose antecedent states that a certain moment m obtains, the similarity between the future of m and the actual future should have—for true futurists—no relevance at all.

It follows, thus, that the counterfactualist has therefore the burden to offer an analysis of counterfactuals such that:

- (i) the relevant notion of similarity is not (at least exclusively) that of similarity between histories;
- (ii) there are true COPs;
- (iii) and, of course, the intuitive truth-value of ordinary counterfactuals is vindicated.

3.2 The problem of chancy counterfactuals

Among the ordinary counterfactuals that appears to intuitively strike us as having a certain truth-value, I shall focus on ‘chancy’ counterfactuals, that is counterfactuals like:

- (11) If I had tossed the coin it would have landed heads(/tails)

Intuitively, under normal circumstances (11) should be countered as false. If I had tossed that coin it might have landed tails and it might have landed heads. However, my flipping the coin would have been in itself insufficient to determine the outcome of the toss. Hence, it seems that it is incorrect to say both that if I had tossed the coin it would have landed tails and that if I had tossed the coin, it would have landed heads. If these line of reasoning is on the

right track, it follows that a necessary condition for any counterfactualist theory of counterfactuals to be successful is that it should predict chancy counterfactuals like (11) to be false.

However, one might argue that counterfactualists are *as such* committed to the highly controversial thesis that there are true chancy counterfactuals. As a matter of fact, also the possibility that a certain counterfactual moment *m* obtains is insufficient to determine its future, but that does not prevent the counterfactualist from affirming that if *m* had been actual, then a certain history *h* would have been the actual history.

Such an objection is, I submit, misguided and overlooks a fundamental difference between COPs like ‘If the counterfactual moment *m* had obtained, *h* would have been the true history’ and chancy counterfactuals like ‘If I had flipped the coin, it would have landed tails’. As a matter of fact, a moment *m* specifies the *total* state of the world at a certain time and, therefore, individuates a *unique* point in the garden of forking paths in which the open future consists. As a result, the counterfactualist could say, by supposing that a certain moment *m* had obtained we are placing ourselves in a *specific* location in the logical space that is, as such, as much determinate as the present moment. Since, however, we think that future-contingent statements are presently true or are presently false, it is also true that either if *m* had obtained *P* would have been true, or that if *m* had obtained *P* would have been false. On the contrary, by supposing only that I had flipped the coin we are under-specifying the location in the logical space of possibilities in which we are placing ourselves: there are, in fact, (perhaps, infinitely) many counterfactual situations in which I toss the coin that are sufficiently similar to the actual moment. Therefore, the information encoded in the antecedent of a chancy counterfactual is *insufficient* to determine whether things would go—even as a matter of mere fact—as the consequent of the counterfactual predicts.

Interestingly enough, the very train of thought showing how counterfactualists are not committed to endorsing the controversial thesis that there are true chancy counterfactuals can provide them with some useful guidelines for an alternative and successful account for counterfactuals. The

counterfactualist seems, in fact, to be in position to tell the following story about COPs and ordinary chancy counterfactuals:

Future-contingent statements are either true or false at the current moment. We have just to ‘wait and see’ to discover their present truth-value, so to speak. The same would have happened if another (counterfactual) moment m had obtained now: We just would have had to ‘wait and see’ to discover its truth-value. Therefore, just as there is a history h belonging to $H(@)$ representing the actual history, there is a history h belonging to $H(m)$ such that it represents the way things would have been, were m to have obtained.

However, the antecedent of ‘If I had tossed the coin it would have landed heads(/tails)’ is insufficient to determine a *unique* moment m and, therefore, a *unique* history h . There are many nearby moments in which I toss the coin. Some of them are such that along their relative-TRL the coin lands heads and some are such that along their relative-TRL the coin lands tails. Therefore the counterfactual(s) ‘If I had tossed the coin it would have landed heads(/tails)’ is(are) false.

In other words, it appears that the following analysis of counterfactuals is available to counterfactualists:

(AC1) $p \Rightarrow q$ is true if, and only if, in all the closest moments m such that p is true with respect to $\langle m, trl(m) \rangle$, q is true with respect to $\langle m, trl(m) \rangle$

Consider, for instance, the following toy-model:

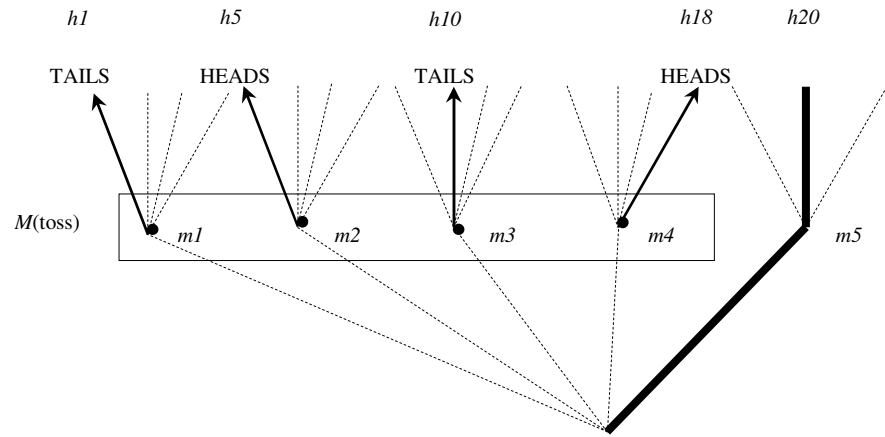


Figure 1

$m5$ is the present moment and $h20$ the actual history; the set $M(\text{toss})=\{m1,m2,m3,m4\}$ is the set of nearby moments in which I toss the coin; $h1, h5, h10$ and $h18$ are the relative-TRL of, respectively, $m1, m2, m3$, and $m4$. The model depicted in figure 1 and (AC1) entail that the following COPs are true at $m5$

$$(12) \quad m1 \Rightarrow \text{tails}^8$$

$$(13) \quad m2 \Rightarrow \text{heads}$$

$$(14) \quad m3 \Rightarrow \text{tails}$$

$$(15) \quad m4 \Rightarrow \text{heads}$$

while neither of the following chancy counterfactuals are:

$$(16) \quad \text{toss} \Rightarrow \text{tails}^9$$

$$(17) \quad \text{toss} \Rightarrow \text{heads}$$

⁸ 'If $m1$ had obtained, then 'the coin will land tails' would have been true'.

⁹ 'If I had tossed the coin, then it would have landed tails'.

It seems, therefore, that by means of (AC1)—or a refined version of it—the counterfactualist is at least in position to take up the challenge posed by chancy counterfactuals.

4. A tension

Let a *toss-normal* moment be a moment m such that I could have tossed a fair coin in normal circumstances (the coin is not biased etc.), but I did not. Intuitively, we would like to say that, necessarily, if a scenario/moment/context is toss-normal then both $\text{toss} \Rightarrow \text{heads}$ and $\text{toss} \Rightarrow \text{tails}$ are false

$$(18) \quad \Box(\text{toss-normal} \rightarrow (\mathbf{False}(\text{toss} \Rightarrow \text{heads}) \ \& \ \mathbf{False}(\text{toss} \Rightarrow \text{tails})))$$

By the semantics for counterfactuals based on similarity between moments we have that:

$$(19) \quad \Box((\text{for every } m \text{ in } M(\text{toss}): (m \Rightarrow \text{heads/tails})) \leftrightarrow \mathbf{True}(\text{toss} \Rightarrow \text{heads/tails}))$$

Necessarily, it is true that if I had tossed the coin it would have landed heads(/tails), if and only if for every moment m belonging to the set of nearby moments in which I toss the coin, it is the case that if m had obtained, then ‘The coin will land heads(/tails)’ would have been true

From (18) and (19) it follows that:

$$(20) \quad \Box(\text{toss-normal} \rightarrow ((\sim \text{for every } m \text{ in } M(\text{toss}): (m \Rightarrow \text{heads})) \ \& \ (\sim \text{for every } m \text{ in } M(\text{toss}): (m \Rightarrow \text{tails}))))$$

which is equivalent to

$$(21) \quad \sim \Diamond[\text{toss-normal} \ \& \ \text{for every } m \text{ in } M(\text{toss}): (m \Rightarrow \text{heads/tails})]$$

It is impossible that: this moment is toss-normal and every nearby moment m in I which I toss the coin is such that, if m had obtained then ‘The coin would have landed heads(/tails)’ is true

(20) and (21) tells us that, for every toss-normal scenario, the relative true futures of counterfactual moments are *correlated*: it is in other words necessary that they do not have all either a future in which the coin lands heads or a future in which the coin lands tails. However, this seems to run against the very idea that, necessarily, the ways the future would have been, had things gone differently, are *independent* from each other. There appears, in other words, to be a *tension* between the two following thesis:

Independency: The relative true futures of merely counterfactual moments represent the ways things would have turned out to be in counterfactual situations. Hence, counterfactual true-futures are *independent* from each other. The fact that, if a certain counterfactual moment *m* had obtained, things would have gone in a certain way does not depend in any way on how things would have gone had other moments obtained instead.

Correlation: at every toss-normal moment it is true that the counterfactual moments belonging to $M(\text{toss})$ —i.e. the nearest counterfactual moments at which the coin is tossed—are *correlated*, that is: it is not the case that the coin lands heads/tails with respect to *every* such moment.

Suppose I now toss a coin and that it is now true to say that the coin will land tails. Since the future is open, there is nothing in the present state of the world that determines that the coin will land tails. It is just a mere fact. The coin could well land heads, instead. Clearly, there are many nearby moments in which I toss the coin. However, it would seem extremely odd to suppose that the actual outcome of my toss is *somehow* linked to the merely possible outcome of those merely possible tosses. If the future is genuinely open, and the present state of the world does not determine whether the coin will land heads or tails, then, *a fortiori*, what would have happened at counterfactual moments should be irrelevant for the present truth of ‘The coin will land tails’. However, the same should apply also for merely counterfactual moments in which I toss the coin I haven’t actually tossed. The local true future of a

counterfactual moment m should represent how things would have gone, had m obtained, as a matter of mere, random and genuinely chancy fact. To suppose, however, that the modal space of historical possibility is such that the relative futures of different moments are somehow correlated is to think that the ‘distribution’ of local true futures on the branching tree of historical possibility is somehow *constrained*. This would appear, however, to essentially put a *limit* to the openness of the future: how can the future of a moment be genuinely open, if it must respect a certain kind of distribution of truths within a certain set of moments to which it belongs? That would be like having a set of coins that are so manufactured that, when simultaneously tossed, can never land all on the same side. How could you say, in that case, that for each coin c , the outcome of the toss of c is *genuinely* random, chancy and ‘open’?

I conclude, therefore, that (AC1) must be rejected and that a feasible counterfactualist account for counterfactuals must not posit any kind of correlation among the relative true futures of counterfactual moments.

5. Refining the counterfactualist analysis of counterfactuals

Let us take stock. So far I have been arguing against Counterfactualism as follows:

- (i) The counterfactualist has to produce a general account for counterfactuals according to which:
 - i. there are true COPs
 - ii. chancy counterfactuals are not true
- (ii) A certain notion of similarity has to be central to any successful account for counterfactuals

- (iii) The only two elements in a counterfactualist framework to which a notion of similarity can be applied to are moments and histories
- (iv) The notion of similarity among histories cannot be employed by the counterfactualist
- (v) Hence, she has to employ a notion of similarity across moments, along the lines of (AC1)
- (vi) However, if the counterfactualist employs a notion of similarity among moments, then she is committed to acknowledge the existence of a mysterious form of *correlation* between the relative true futures of counterfactual moments, which appears to be in tension with the thesis that the future of counterfactual moments is objectively open.

At this point, one might object that what only my argument against the counterfactualist shows is that her analysis of counterfactuals involving the notion of similarity between moments is simply more complicated than the one featuring in (AC1). In particular, one might think that the counterfactualist can employ a sort of ‘mixed’ analysis of counterfactuals using together both the notion of similarity among histories and the notion of similarity among moments.

As we have seen above, it seems highly intuitive that if the future of counterfactual moments is objectively open, then there can be no correlation among their possible futures. Therefore, the counterfactualist has to allow for the possibility of there being a toss-normal moment *m* such that every closest moment to *m* in which the coin gets tossed is such that it is true to say *at m* that if the coin had been tossed, then it would have landed—say—heads. Therefore, the truth-value of the chancy counterfactual ‘If I had tossed the coin it would have landed heads’ cannot simply depend on what goes on along the relative

thin red line of the closest counterfactual moments. But surely the truth-value of COPs like $m \Rightarrow \text{heads}$ *must* depend on the fact that the along the thin red line of m the coin lands heads.

This train of thought suggests thus the following possibility for the counterfactualist:

- (AC2) If there is just one moment m at which p is true, then $p \Rightarrow q$ is true if, and only if q is true at $\langle m, \text{trl}(m) \rangle$; otherwise, $p \Rightarrow q$ is true if, and only if q is true with respect to all the closest histories at which p is true.

Consider figure 2:

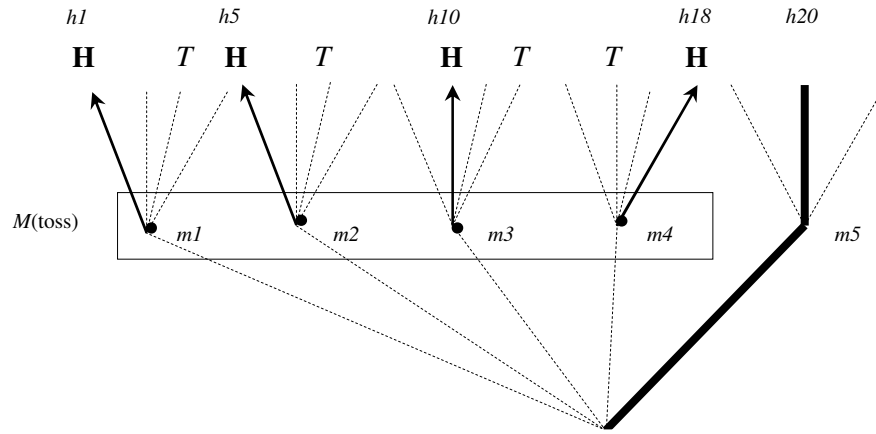


Figure 2

Since $m1$, $m2$, $m3$, and $m4$ are the closest toss-moments, we can safely suppose that the set $\{h1, h2, \dots, h2, h18\}$ is the set of the closest toss-histories. Therefore, since it is false that there is only one moment m such that ‘the coin is tossed’ is true at m , the truth value of $\text{toss} \Rightarrow \text{heads}$ will depend on whether with respect to all histories belonging to $\{h1, h2, \dots, h2, h18\}$ it is true that the coin lands heads. However, since this is not in fact the case, $\text{toss} \Rightarrow \text{heads}$ is to be assessed as not true, as our intuitions mandate.

However, even this refined analysis for counterfactuals harbors a problem. Consider in fact the following sentence:

- (22) If one of the moments in $M(=\{m1,m2,m3,m4\})$ had obtained, then
‘The coin will land heads’ would have been true

$$[(\exists m(m \ \& \ m \in M)) \Rightarrow \text{heads}]$$

In the toy model we are considering (figure 2) every moment m in $\{m1,m2,m3,m4\}$ is such that $trl(m)$ is a heads-history and, hence, it is true that:

- (23) $m1 \Rightarrow \text{heads} \ \& \ m2 \Rightarrow \text{heads} \ \& \ m3 \Rightarrow \text{heads} \ \& \ m4 \Rightarrow \text{heads}$

Therefore, it seems that also (22) should be true. But according to the semantics just given it is not. As a matter of fact, there is not a *unique* moment m such that ‘one of the moments in $M(\text{toss})$ obtains’ is true (since that is true with respect to every moment in $M(\text{toss})$) and, hence, given the validity of (AC2) the truth-value of (22) will depend on whether in every history belonging to $\{h1,h2,...,h18\}$ the coin does land heads. But in our toy model this is not the case and hence (22) is not true.

The problem here is that both antecedents of

- (22) If one of the moments in $\{m1,m2,m3,m4\}$ had obtained, then ‘The coin will land heads’ would have been true

and

- (24) If I had tossed coin, it would have landed heads.

determine the same set of nearby moments. But intuitively, we would like the truth value of (22) to depend on the thin red line of the nearby moments in question, but the truth value of (24) to depend on all histories passing through such moments and not only their thin red lines. Nevertheless, if we look more closely to the counterfactuals

- (25) If $m1$ had obtained, ‘The coin will land heads’ would have been true

- (22) If one of the moments in $\{m1, m2, m3, m4\}$ had obtained, then ‘The coin will land heads’ would have been true

we can notice an important difference with chancy counterfactuals like

- (24) If I had tossed the coin, it would have landed heads.

As a matter of fact, only in the case of (22) and (25) the set of *nearby* moments at which the antecedent of the counterfactual is true is identical with the set of *possible* moments at which the antecedent of the counterfactual is true. In the case of (24), instead, the set of closest moments at which ‘I toss the coin’ is true is simply a proper subset of the set of possible moments at which ‘I toss the coin’ is true. This appears to be an important difference between the two kinds of counterfactuals and suggests the following refined version of (AC2):

- (AC3) If the closest p -moments are the *only* possible moments at which p is true, then $p \Rightarrow q$ is true if, and only if, for every moment m belonging to the set of closest p -moments, q is true with respect to every point $\langle m, trl(m) \rangle$; *otherwise*, $p \Rightarrow q$ is true if, and only if, for every moment m belonging to the set of closest p -moments, q is true with respect to $\langle m, h \rangle$, where h is a history passing through m .

According to AC3, the thin red line of a set of moments M is called into consideration only when we are interested in the members of M *as such*—as it were—and not insofar they are the *closest* moments at which the antecedent of the counterfactual conditional in question is true. It is easy to see that AC3 predicts (22) and (25) to be true and (24) to be false at $m5$ in the toy model depicted in figure 2.

AC3 appears thus not only to be an adequate counterfactualist account for counterfactuals, since it seems to manage to make some COPs true and chancy counterfactuals false without entailing any kind of correlation among the thin red lines of counterfactual moments, but also to efficaciously explain the behavior of counterfactuals in a counterfactualist setting. However, a serious problem appears to lurk also for this refined version of CTF. Consider in fact the following intuitively valid inference patterns:

SUBSTITUTION:

From $p \Rightarrow q$, $q \Rightarrow p$ and $q \Rightarrow r$, infer $p \Rightarrow r$

LIMITED TRANSITIVITY:

From $p \Rightarrow q$ and $(p \ \& \ q) \Rightarrow r$, infer $p \Rightarrow r$

Substitution says that if two propositions counterfactually entail each other (if they are, as we might call them, *counterfactually equivalent*¹⁰) then ‘either may be substituted for the other, *salva veritate*, as the antecedent of any subjunctive conditional’ (Bennett, p. 299). Limited Transitivity says that a proposition r is counterfactually entailed by a proposition p , if p entails a proposition q such that r is entailed by the conjunction of p and q .

The two inference rules strike as valid. However, an unwelcome result of AC3 is that it predicts there to be counterexamples to both. Consider in fact the following set of sentences (keeping in mind that we are still considering the toy scenario represented in figure 2):

SUBSTITUTION:

- (i) $\text{toss} \Rightarrow \exists m(m \ \& \ m \in M)$
- (ii) $(\exists m(m \ \& \ m \in M)) \Rightarrow \text{toss}$
- (iii) $(\exists m(m \ \& \ m \in M)) \Rightarrow \text{heads}$
- (iv) $\sim[\text{toss} \Rightarrow \text{heads}]$

LIMITED TRANSITIVITY:

- (i) $\text{toss} \Rightarrow \exists m(m \ \& \ m \in M)$
- (ii) $[\text{toss} \ \& \ \exists m(m \ \& \ m \in M)] \Rightarrow \text{heads}$
- (iii) $\sim[\text{toss} \Rightarrow \text{heads}]$

If I had tossed a coin, one of the moments belonging to $M(\text{toss})$ would have obtained. In the same way, if one of the moments belonging to $M(\text{toss})$ had

¹⁰ See Stalnaker (1984:140)

obtained, then I would have tossed a coin. However, if one of the moments belonging to $M(\text{toss})$ had obtained, then ‘The coin will land heads’ would have been true. But it is false that if I had tossed a coin it would have landed heads, even if it is also true that if I had tossed a coin and one of the moments belonging to $M(\text{toss})$ would have obtained, then the coin would have landed heads.

So far, after having rejected a counterfactualist account for counterfactuals based on the notion of similarity among histories, we have tried to provide a moment-based similarity account for counterfactuals firstly by putting forward AC1 and then by refining it by means of AC2 and AC3. At this point, however, it appears that we can no longer go forward and try to refine also AC3. The reason is that the failure of Substitution and Limited Transitivity appears to be part and parcel of the very spirit of Counterfactualism, once the thesis of *No Correlation* is accepted.

As a matter of fact, in order to establish the incompatibility between the thesis of Counterfactual Openness and Counterfactualism we do not need to appeal to any specific semantics for counterfactuals. What we only need is the thesis that the set of *points* (possible histories, possible moments, etc) that are relevant for the truth-conditions of chancy counterfactuals like ‘if I had tossed the coin, it would have landed tails’ determine, at every toss-normal moment m , a set M of counterfactual moments such that, it is true at m that

(Z1) If I had tossed the coin, then one moment belonging to M would have (then) obtained

Notice that it follows from the Lewisian account for counterfactuals that, for toss-normal situation S , there is a set of worlds W such that it is true in S that

(Z1b) If I had tossed the coin, then one world belonging to W would have obtained

In this case, W is simply the set of nearby worlds in which I toss the coin (at the time in question). In our case, quite independently from the specific account for counterfactuals the counterfactualist might put forward, once we

accept that a certain notion of similarity must be central to any possibly successful account for counterfactuals, it seems difficult to deny that the truth-conditions for ‘If I had tossed the coin, then q ’ are not such as to single out a set M of moments such that (Z1) is true. In particular, as we can speak of nearby worlds and histories we can surely speak of nearby moments. Therefore, there is a set of moments such that it is the set of nearby moments at which I toss the coin. If that is correct, however, calling ‘ M ’ such a set, it appears equally difficult to deny that (Z1) is true. Hence, our first premiss appears to be plausible enough.

Secondly, if we accept the thesis that the relative thin red lines of counterfactual moments are independent from each other, and so the truth-values of the correspondent COPs are not correlated, we must admit the possibility of a certain toss-normal situation K such that, where M is the set of moments that makes (Z1) true in K , it is true that

- (Z2) If one of the moments belonging to M had obtained, then ‘the coin will land heads’ would have been true

Furthermore, by the very definition of M it follows that

- (Z3) If one of the moments belonging to M had obtained, then I would have tossed the coin

However, by Substitution, (Z1), (Z2) and (Z3) entail that

- (Z4) If I had tossed the coin, then ‘the coin will land heads’ would have been true

and, hence,

- (Z5) If I had tossed the coin, the coin would have landed heads

By the same token, from the very definition of M it intuitively follows that it is also true that

(Z6) If I had tossed the coin and one of the moments belonging to M had obtained, then ‘the coin will land heads’ would have been true

But (Z4) and (Z5) follow also from (Z1) and (Z6), by Limited Transitivity.

I conclude, therefore, that regardless of the validity of AC3 or of any specific account of counterfactuals, Counterfactual True-Futurism is incompatible with the idea that the future of counterfactual moments is objectively open and, hence, that it is inconsistent with the very spirit of True-Futurism.

6. Conclusion

Counterfactual True-Futurism is the thesis according to which, even if the future of counterfactual moments is open, there is a fact of the matter as to which future would have been their true future had they obtained. The argument I have put forward in this chapter shows instead that *Counterfactual Openness* and *Counterfactual Determinacy* are incompatible, at least if we want to salvage the intuitive falsity of chancy counterfactuals (*‘No True Chancy Cs’*). As a matter of fact, we have on the one hand that *Counterfactual Openness* intuitively entails that the identity of the true future of a certain counterfactual moment *m* is not constrained by the identity of the true future of other moments (*‘No Correlation’*) on the other hand, we have also that if there are true counterfactuals of freedom (and chancy counterfactuals are false), then there is a certain kind of modal correlation between the true futures of counterfactual moments. My argument against Counterfactual True-Futurism can thus be summarized as follows:

ARGUMENT C

(C1) *Counterfactual Openness* \rightarrow *No Correlation*

(C2) *No True Chancy Cs*

(C2) (*Counterfactual Determinacy* & *No True Chancy Cs*) \rightarrow
Correlation

(C3) *Counterfactual Openness* \rightarrow *Counterfactual Indeterminacy*

I conclude, therefore, that true-futurists are as such committed to the rejection of *Counterfactual Determinacy* and of the thesis that there are true counterfactuals of openness and, hence, that Factual True-Futurism is *the* true true-futurist theory.

Chapter 7

The logic of true futurism II—The True Logic of True-Futurism

1 Introduction

1.1 Summing up

In the last chapter, I have argued that true-futurists are committed to *Factual True-Futurism*, that is the thesis that there are no true counterfactuals of openness (COPs). This amounts to saying that, for every counterfactual moment m and future-contingent statement P (with respect to m), although it is true that

- (1) If m had obtained, then P would have been either true or false
Obtain(m) \Rightarrow [True(P) or False(P)]

it is both false to say that

- (2) If m had obtained, then P would have been true
Obtain(m) \Rightarrow True(P)

and that

- (3) If m had obtained, then P would have been false
Obtain(m) \Rightarrow False(P)

Furthermore, at the end of chapter 5 I have argued that the notion of sentence-truth at a moment should be constrained by the following principle:

(LINK) It is the case that [if m had obtained, then S would have been true/false/neither-true-nor-false/either-true-or-false] if, and only if, S is *determinately* true/false/neither-true-nor-false/either-true-or-false at m .

From LINK and the thesis that there are no true COPs it follows that any successful theory for True-Futurism must be such that its notion of sentence truth at a moment does not predict that, for any counterfactual moment m and future-contingent statement P with respect to m , P is true with respect to m . However, this is precisely what happens with the relative-TRL theory I have dubbed ‘OR-TRL theory’. As a matter of fact, according to OR-TRL, (i) every moment m on the branching tree of historical possibilities has its own TRL and (ii) sentence truth at a moment is defined as follows:

(4) S is true at m iff S is true at $\langle m, trl(m) \rangle$

which entails that for *every* moment m and sentence S (and, hence, also for every counterfactual moment m and future-contingent statement S with respect to m) either S is determinately true at m or S is determinately false at m , contrary to what Factual True-Futurism mandates. It follows that OR-TRL is to be rejected.

1.2 True-Futurism: the *desiderata*

From what I have been arguing so far, it follows that an adequate true-futurist theory must meet the following *desiderata*:

- (A1) The principle of bivalence is unrestrictedly valid (i.e.: the notion of truth at a temporal point governing the theory must be such that, for every temporal point k and sentence S , either S is true at k or S is false at k)
- (A2) For every counterfactual moment m and sentence S , it is true that if m had obtained, then either S would have been true or S would have been false

- (A3) There are no true counterfactuals of openness: for every counterfactual moment m and future-contingent statement Fp with respect to m it is false to say both that, if m had obtained, then Fp would have been true and that, if m had obtained, then Fp would have been false (in other words the theory must be a factual true-futurist theory)
- (A4) (PF) must be valid (see chapter 5)
- (A5) Truth-Value Links must hold (see chapter 5)

In this chapter I aim to put forward two adequate true-futurist theories complying with (A1-5). Both theories are *ockhamist* theories, in the priorean sense reviewed in chapter 5. In other words, both theories define a notion of truth at a $\langle m, h \rangle$ pair as follows (see chapter 5, section 3):

- (B1) p is true at $\langle m, h \rangle$ iff p belongs to $V(m)$ (for any atomic p)
- (B2) ' $p \ \& \ q$ ' is true at $\langle m, h \rangle$ iff p is true at $\langle m, h \rangle$ and q is true at $\langle m, h \rangle$
- (B3) ' $\sim p$ ' is true at $\langle m, h \rangle$ iff p is not true at $\langle m, h \rangle$
- (B4) ' $p \vee q$ ' is true at $\langle m, h \rangle$ iff either p is true at $\langle m, h \rangle$ or q is true at $\langle m, h \rangle$
- (B5) ' $p \rightarrow q$ ' is true at $\langle m, h \rangle$ iff, if p is true at $\langle m, h \rangle$, then q is true at $\langle m, h \rangle$
- (B6) ' Fp ' is true at $\langle m, h \rangle$ iff there is a moment m' belonging to h such that $mR_{br}m'$ and p is true at $\langle m', h \rangle$
- (B7) ' Pp ' is true at $\langle m, h \rangle$ iff there is a moment m' belonging to h such that $m'R_{br}m$ and p is true at $\langle m', h \rangle$
- (B8) ' $\Box p$ ' is true at $\langle m, h \rangle$ iff for every h' such that m belongs to h' , p is true at $\langle m, h' \rangle$

However, while the first theory ('ATL') employs a notion of absolute TRL and takes as its central notion of sentence truth that of sentence truth at time, the second ('RTL') uses a notion of relative TRL and takes moments to be its relevant temporal parameters. In addition, ATL relativizes sentence truth only with respect to a single time parameter (which we might think of as the time of utterance) and, therefore, qualifies as 'absolutist' in MacFarlane's usage of the term. RTL, instead, relativizes sentence truth with respect to two moments (the time of utterance and of assessment) and, hence, qualifies as 'truth-relativist'. Let us review them in turn.

2 Absolute Thin Red Line and Factual True Futurism

2.1 Truth-at-a-time, bivalence and counterfactuals of openness

The most important notion within a theory T , for a certain subject matter K , is the one on the basis of which validity and logical consequence are defined. Usually, there is a certain set of points of some sort with respect to which the notion of sentence-truth is defined—for instance: a set of possible worlds in propositional modal logic. That notion is then used to define validity and logical consequence, usually along the following lines:

- (5) A sentence S is valid if, and only if, for every point k and model M , S is true at k in M
- (6) A sentence Q is a logical consequence of a sentence P if, and only if, for every model M and point K such that P is true at k in M , Q is also true at k in M

Intuitively, in a framework in which tense is treated by means of temporal operators and atomic propositions are thought of as capable of changing truth-value across time, the relevant kind of points must have a temporal nature. So far, we have taken *moments* as the relevant temporal points central to our true-futurist theory. Moments do have a certain temporal nature, since they are ordered by a sort of earlier-later relation. Furthermore, they are the basic

elements of our models, out of which histories are constructed. However, the problems we have encountered so far suggest that the central notion in a true-futurist theory cannot be that of sentence-truth at a moment.

The first factual true-futurist theory I shall present in this chapter (that I will label ‘ATL’) makes the fundamental move of defining sentence-truth not as relative to moments, but to *times* instead.

What are times? The set of times can be seen as the ‘horizontal division’ of the tree of time, as sketched in Figure 1:¹

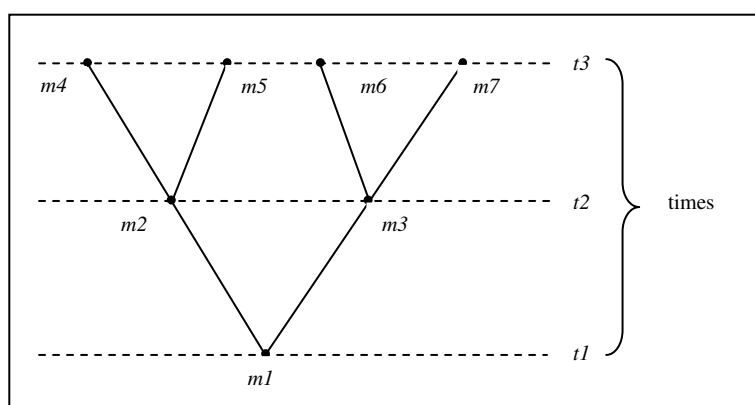


Figure 1

The intuitive idea behind the introduction of times is the following: moments represent, intuitively, not only possible ways things might turn out to be, but possible ways things might turn out to be *at a certain stage of history*. In September 2008 United States were struck by a financial crisis that was later to spread out to the rest of the world. We might think, however, that in 2006 it was not yet settled that a financial crisis would strike the US in 2008. This means that, from the point of view of the actual 2006, there were other possible 2008s, as it were, in which no financial meltdown occurs in the US. In an ATL-model, the possible 2008s are represented by different moments and the fact that they all represent a way in which *the year 2008* might have turned out to be is represented by the fact that all such moments lie (in some relevant sense) *at the same time*, that is: 2008.

¹ What I am here calling ‘times’ are called ‘instants’ by many authors, including Belnap et al (2001). See Belnap et al. (2001) for a rigorous definition of the notion of *instant* and Di Maio and Zanardo (1994) for the necessity of a ‘horizontal division’ of the tree of time in branching settings.

Similarly, consider the aristotelian question that allegedly originates the philosophical debate on future-contingents: ‘Will there be a sea-battle tomorrow?’ Thinking that the future is not settled today as to whether there will be a sea battle tomorrow only amounts to thinking that there are a plurality of possible tomorrows, that is: a plurality of moments ‘lying on’ the same time, representing the possible ways things might turn out to be once a day will have elapsed.

There are many possible ways to ‘synchronize’ histories in order to take moments to be able to occur ‘at the same time’ (see Di Maio and Zanardo 1994). For simplicity’s sake, however, I will simply add to our models a *linearly* ordered set T of times, such that any time is (properly) associated with a unique set of moments. In the figure above, for instance, t_2 is associated with $\{m_2, m_3\}$, so that m_2 and m_3 can be said to ‘lie’ at the same time (although along different histories). We can thus have a two-place function mom such that for any history h and time t , $mom(h, t)$ is the moment that lies on h at time t .

A model M for ATL is a 6-tuple $\langle \mathbf{M}, V, T, mom, R_{br}, R_{lin}, TRL \rangle$, where \mathbf{M} is a non-empty set of moments, V is a valuation function from the set of moments to the power set of atomic propositions, T is a non-empty set of times, mom is the function just mentioned above, R_{br} is a ‘branching’ earlier-later relation between moments, R_{lin} is a linear earlier-later relation between times and TRL is the absolute thin red line.

The notion of sentence-truth at a time in an ATL model can be defined as follows:

$$(ATL) \text{ TRUE}(S, t) \text{ iff } T(S, mom(TRL, t), TRL)$$

In English: *a sentence S is true at a time t (in a TRL -model M) if, and only if, S is true with respect to the TRL (of M) and the moment that lies at time t on the TRL (of M).*

It is straightforward to prove that (A1), (A4) and (A5) hold in ATL. As a matter of fact, we have from (ATL) the following definition of validity:

$$(7) \quad \text{A sentence } S \text{ is valid iff } S \text{ is true at any time in any model}$$

from which it follows that:

- for any time t and model M , S is either true at t or false at t ²
- there is no model M and two times $t1$ and $t2$ such that $t2$ is later than $t1$, p is true at $t2$ in M but ' Fp ' is not true at $t1$ in M ³
- for every time t and model M , ' $p \rightarrow PFp$ ' is true at t in M ⁴

2.2 Counterfactual indeterminacy and determinate truth at a moment

What about (A3)? Within ATL we have two notions of sentence truth:

- (i) the priorean/ockhamist notion of sentence truth at a $\langle \text{moment}, \text{history} \rangle$ pair
- (ii) the notion of sentence-truth at a time.

How can we speak of sentence-truth *at a moment*?

Intuitively, if the moment m in question lies on the TRL of our model, for a sentence S to be true at m , just is for S to be true at $t(m)$, where $t(m)$ is the time at which m lies. On the other hand, if m lies off the TRL, asking the truth-

² *Proof*: Suppose that there is an ATL-model M such that, at a time t , S is neither true nor false at t . Therefore, by (ATL), there is a pair $\langle m, h \rangle$ such that S is neither true nor false at m . But the notion of sentence-truth at a $\langle \text{moment}, \text{history} \rangle$ pair is, by definition, bivalent. *Contradiction!* Hence, for every sentence S , ATL-model M and time t , S is either true at M and t or false at M and t . ■

³ *Proof*: Suppose that there is an ATL-model M and two times $t1$ and $t2$ such that (a) $t2$ is later than $t1$, (b) p is true at $t2$ in M but (c) ' Fp ' is not true at $t1$. p is true at $t1$. Hence, p is true at $\langle \text{mom}(t2), \text{TRL} \rangle$. From (B6) it follows that for every moment m' belonging to the TRL ' Fp ' is true at $\langle m', \text{TRL} \rangle$. $\text{mom}(t1)$ belongs to the TRL; therefore ' Fp ' is true at $\langle \text{mom}(t1), \text{TRL} \rangle$ and, hence, by (ATL), ' Fp ' is true at $t1$. *Contradiction!* Hence: there is no model M and two times $t1$ and $t2$ such that $t2$ is later than $t1$, p is true at $t2$ in M but ' Fp ' is not true at $t1$ in M . ■

⁴ *Proof*: Suppose that there is a time t and ATL-model M such that ' $p \rightarrow PFp$ ' is not true at t in M . From (ATL) we have that ' $p \rightarrow PFp$ ' is not true at $\langle \text{mom}(t), \text{TRL} \rangle$. If p is true at $\langle \text{mom}(t), \text{TRL} \rangle$, however, it follows—by (B6) and (B7)—that ' PFp ' is true at $\langle \text{mom}(t), \text{TRL} \rangle$. Hence, by (B5), ' $p \rightarrow PFp$ ' is true at $\langle \text{mom}(t), \text{TRL} \rangle$. *Contradiction!* Therefore, for every time t and ATL-model M , ' $p \rightarrow PFp$ ' is true at t in M . ■

value of a sentence S at m seems equivalent to asking what would be the truth value of S at $t(m)$, were m to have belonged to the TRL:

- (Q1) Had m belonged to the TRL, what would have been the truth-value of S at $t(m)$?

Let then the notion of *trl-variance* be defined as follows:

- (VAR) a model M is a *trl-variant* of a model M' if, and only if, M is identical with M' except possibly for what concerns the identity of the TRL

Consider then the claim:

- (K1) If the circumstances represented by m had obtained, then ' Fp ' would have been true

Within an ATL framework, the following clause appears to adequately express the adequate truth-conditions for (K1)

- (KTC) K1 is true iff for every model M' , such that M' is a trl-variant of (the actual model) M and m_2 belongs to the TRL of M , ' Fp ' is true at $t_2 (=t(m_2))$

This should be intuitively enough: when we ask whether Fp would have been true were m_2 to have been actual, we are asking whether Fp would have been true were m_2 to have belonged to the TRL. Therefore, we are asking to consider what would be the case in models which possibly differ from the actual one only for what concerns the identity of the TRL. However, there are many models in which the TRL passes through m_2 and everything else is just like in our model. Therefore, asking whether Fp would have been true were m_2 to have been actual is (within an absolute TRL framework) tantamount to asking whether Fp is true at t_2 (the time of m) in every model M' such that: (i) M' is a trl-variant of M and (ii) in M' , m belongs to the TRL. Given that only in some such models Fp is true at t_2 (and only in some models Fp is false at t_2) we have thus that the two following claims are *false*:

(K1) If the circumstances represented by m had obtained, then ' Fp ' would have been true

(K2) If the circumstances represented by m had obtained, then ' Fp ' would have been false

and so (A3) is true. However, since in every such model ' Fp ' is either true or false, (A2) turns out to be true and so that Factual True-Futurism is vindicated.

Accommodating Factual True-Futurism by quantifying over *models* might appear too unorthodox a strategy to many. Luckily, there appears to be another way for factual true-futurists to model the phenomenon of counterfactual indeterminacy that doesn't require any kind of quantification over models. As a matter of fact, in chapter 5 I have advanced an absolute-TRL theory—'SA-TRL'—employing a supervaluationist treatment of sentence truth at a moment. According to SA-TRL

- (8) S is true at m iff S is true at $\langle m, h \rangle$, for every h belonging to $fut(m)$;
 S is false at m iff S is false at $\langle m, h \rangle$, for every h belonging to $fut(m)$;
otherwise, S is neither true nor false at m

where fut is a function from the set of moments to the set $H(M)$ of all histories on the model such that:

- (9) If m belongs to TRL, then $fut(m) = \{TRL\}$
If m does not belong to TRL, then $fut(m) = H(m)$

Recall that:

- $H(m)$ is the set of all histories h , such that m belongs to h , i.e. the set of all histories that “pass through” m
- For any moment m , the function $fut(m)$ answers the question: which is the history h belonging to $H(m)$ —i.e. the set of histories passing through m —that represents the way things will in fact turn out to be in the future of m ? If m is on TRL then the answer is

determinate. If, on the other hand, m does not belong to TRL, the answer is indeterminate and such indeterminacy is reflected by the fact that the value of $fut(m)$ is not a singleton (as $\{TRL\}$), but the very set $H(m)$. (see chapter 5)

As we have seen in chapter 5, however, given the validity (L1)

- (L1) If it is the case that [if m had obtained, then S would have been true/false/neither-true-nor-false/either-true-or-false], then S is true/false/neither-true-nor-false/either-true-or-false at m

and the fact that, for true-futurists, for every moment m and sentence P it must be true that

- (1) If m had obtained, then P would have been either true or false
Obtain(m) \Rightarrow [True(P) or False(P)]

SA-TRL must be rejected. As a matter of fact, for every counterfactual moment m (that is: for every moment m lying off the absolute thin red line) and every future-contingent statement P with respect to m , SA-TRL predicts that

- (10) P is neither true nor false at m

from which and LINK it follows that

- (11) If m had obtained, then P would have been neither true nor false
Obtain(m) \Rightarrow [\sim True(P) or \sim False(P)]

contrary to our assumptions about True-Futurism.

However, the idea of a supervaluationist treatment of sentence truth at a moment was not completely on the wrong track. As a matter of fact, the factual true-futurist thesis, according to which there are no true COPs, is just a thesis about the *actual determinacy* and *counterfactual indeterminacy* of the truth-value of future-contingent statements with respect to moments. In other words, for factual true-futurists, while for every actual moment m and future-contingent statement P , the truth-value of P at m is *determinate* and, hence

(12) P is either determinately true or determinately false at m

for every counterfactual moment m' , P 's truth-value at m' is *indeterminate*, that is

(13) P is neither determinately true nor determinately false at m'

Hence, what appears to be wrong with SA-TRL is not the application of supervaluationism *per se*, but the fact of taking what is defined in (8) to model the notion of *plain* sentence-truth at a moment. The notion of *super-truth* at a moment m (that is the notion of being true at every $\langle m, h \rangle$ pair, where m belongs to $fut(m)$) appears, in other words, to capture the notion of *determinate truth* instead, so that (8) should be in fact replaced with

(14) S is *determinately* true at m iff S is true at $\langle m, h \rangle$, for every h belonging to $fut(m)$;
 S is *determinately* false at m iff S is false at $\langle m, h \rangle$, for every h belonging to $fut(m)$;
otherwise, S is neither *determinately* true nor *determinately* false at m .

Within an absolute TRL framework, (14) predicts that at any counterfactual moment m a future-contingent statement Fp is neither determinately true nor determinately false at m . From this and LINK

(LINK) It is the case that [if m had obtained, then S would have been true/false/neither-true-nor-false/either-true-or-false] if, and only if, S *determinately* is true/false/neither-true-nor-false/either-true-or-false at m .

it follows that the COPs

(15) If m had obtained, Fp would have been true

(16) If m had obtained, Fp would have been false

are false. Furthermore, not only (14) is consistent with the claim according to which future-contingent statement would have been bivalent also at counterfactual moments

(17) If m had obtained, Fp would have been either true or false

but the treatment of determinate truth displayed in (14) appears to be in keeping with the following definition of being determinately either true or false

(18) S is determinately *either true or false* at m iff S is either true at $\langle m, h \rangle$ or false at $\langle m, h \rangle$, for every h belonging to $fut(m)$

Within an ATL framework, (19) predicts for any future-contingent statement Fp and counterfactual moment m

(19) S is determinately either true or false at m

which, in turn, entails (given the validity of LINK) (19), whose truth, conjoined with the falsity of (15) and (16), is precisely what is required by Factual True-Futurism.

To sum up: within ATL we have three notions of sentence truth:

- (i) sentence truth at a *<moment-history> pair*
- (ii) sentence-truth at a *time*
- (iii) sentence-truth at a *moment*

For every such notion the principle of bivalence is determinately valid:

(20) It is determinately the case that [S is either true at k or false at k]

however, the principle of determinate bivalence

(21) [Either S is determinately true at k] or [S is determinately false at k]

is valid only for the first two notions, since for moments m lying off the thin red line and any future-contingent statement P with respect to m it is true instead that

(22) P is neither determinately true at m nor determinately false at m

(22), however, just reflects the phenomenon of *counterfactual indeterminacy*, which as I have argued in the last chapter, is something any true-futurist must as such acknowledge.

I conclude thus that ATL is the true logic for True-Futurism within an absolute thin red line framework.

3 Relative Thin Red Line and Factual True Futurism

3.1 Open future, bivalence and relative truth

In the last section Factual True-Futurism was accommodated within an *absolute* TRL setting. Interestingly enough, however, it is possible to put forward also a *relative* TRL and Factual True-Futurist theory. All the R-TRL theorist has to do in order to comply with (A1-5) is to *doubly* relativize the notion of sentence-truth central to her theory both to a ‘moment of utterance’ and to a ‘moment of assessment’. Where c and a are two moments (of *utterance* and *assessment*, respectively) such that c belongs to $\text{trl}(a)$, the definition of sentence-truth goes as follows:

(RTL) S is true at $\langle c, a \rangle$ iff S is true at $\langle c, \text{trl}(a) \rangle$

The resulting framework, which we might label ‘RTL’, can thus be deemed to be *truth-relativist* in John MacFarlane’s usage of the term.⁵

For Factual True-Futurism, future-contingent statements have a definite truth-value which is determined by the fact that a certain history is actual. Therefore, the identity of the actual history is required, in some sense, *prior* to the evaluation of a certain future-contingent statement. Within RTL, the

⁵ For a presentation and discussion of contemporary truth-relativism in the sense used here see, especially, MacFarlane (2003,2005,2008)

identity of the actual history is not an *absolute* fact, but is *relative* to moments. However, the idea behind the relativistic R-TRL theory represented by (RTL) is that being actual is not only relative (in the sense in which the TRL is relative in a relative thin red line framework), but also *perspectival*: the truth-value of a certain sentence with respect to a certain moment (thought of as the ‘moment of utterance’) depends on which history (among the histories passing through that moment) is the actual history; however, the identity of the actual history is not determined by the moment of utterance, but by the moment *from the point of view of which* such sentence is actually evaluated. This imposes the constraint that the moment of assessment a must be such that the moment of utterance c belongs to its thin red line, in order to take the utterance in question (thought of as a <sentence, moment> pair) as belonging to the ‘actual history’.

From (RTL), validity is defined as follows:

- (23) A sentence S is valid iff, in any model M , for every pair of moments $\langle m1, m2 \rangle$, such that $m1$ belongs to $trl(m2)$, S is true at $\langle m1, m2 \rangle$

It is straightforward to prove that (RTL) and (25) guarantee both the unrestricted validity of the principle of bivalence and of (PF).

3.2 No *ad hoc* requirement

The fact that in an RTL framework the notion of sentence-truth is defined only for pair of moments <moment of utterance (c), moment of assessment (a)> such that c lies on the relative thin red line of a might appear suspicious, artificial and *ad hoc*. However, at a closer look, it proves to actually embody the very spirit of True-Futurism.

The solution I have proposed in order to vindicate principles (A1)-(A5) within an absolute thin red line framework is that of defining the notion of sentence truth not to moments, but to times instead, which are linearly ordered. More in general, the gist of such a solution is that the problems seemingly besetting True-Futurism can be overcome by the existence of a linear order of temporal points on the branching tree of historical possibilities. Within an absolute thin red line framework, such order is given by the absolute thin red

line itself. Instead, within a relative thin red line framework, each moment imposes on the branching tree a ‘local linear order’, as it were, that is a single history marked as the local thin red line of the moment in question.

Within ATL, the identity of the thin red line is given prior to the evaluation of the truth-value of a certain sentence S at a given time t , that is: *firstly* we set the identity of the thin red line, and *then* we evaluate sentences with respect to the moments belonging to it. In the same vein, also within a relative thin red line framework we also have first to establish the identity of the thin red line in order to evaluate sentences with respect to the moments belonging to the thin red line. Since, however, in a relative thin red line framework the thin red line is something relative to moments, it follows that firstly we have to choose which is the moment determining the identity of the thin red line and only *then* we can evaluate sentences with respect to moments lying on the chosen history. In other words, in a relative thin red line setting, we firstly have to choose which is the moment *from the perspective of which* we are looking at the branching tree of possibilities and only then we can pick one of the moments lying on its thin red line in order to evaluate a sentence.

In order to better appreciate why suspects of ad hocery are in this case misplaced, a comparison with two kinds of propositional modal systems for the actuality operator might help.

The main idea for a semantics for the actuality operator in propositional modal logic is the following:

(AC1) ‘actually p ’ is true at a possible world w if, and only if, p is true with respect to the actual world @

There are two main ways to accommodate this idea. The first is to augment the traditional models $\langle W, V \rangle$ for propositional modal logic (where W is a non-empty set of worlds, and V is the usual valuation function) with a *designated world* @, so that a model becomes in this case a triple $\langle W, V, @ \rangle$ where @ belongs to W and represents the actual world. In this case, (AC1) as it stands is the correct semantics of ‘actually’, since it is the model itself that specifies which, among all the possible worlds, is *the* actual one.

However, ‘actually’ can be accommodated also in a framework in which there is no absolute fact of the matter as to which is the actual world. In this kind or ‘relativistic’ framework, we retain the standard models but we define sentence truth to pairs $\langle w, w' \rangle$ of possible worlds, where w is the world of evaluation and w' is the *relative* actual world, that is the world that is *held fixed* as the actual world. In this framework, the semantics for ‘actually’ is given as follows

(ACT2) ‘actually p ’ is true at $\langle w, w' \rangle$ if, and only if, p is true with respect to $\langle w', w' \rangle$

In other words, the actuality operator shifts the world of evaluation to the (relative) actual world.⁶⁷

Let us then add to our models an accessibility relation R according to which some worlds w and w' are such that w has not access to w' ($\sim wRw'$). In this new framework, not every world is a *possible* world with respect to any other world and, therefore, it would seem natural to require sentence-truth to be defined only with respect to pairs $\langle w, w' \rangle$ such that w is a possible world with respect to w' (that is: such that $w'Rw$). Why? The relativization of sentence truth to both a world of evaluation and a world considered as actual should intuitively model a situation in which we take a *possible* world w and consider the truth-value of a certain sentence S with respect to w taking together a world w' to be the actual world. If, however, w' is not accessible from w , it follows from the intended meaning of the accessibility relation R , that w is *not* a possible world with respect to w' . Hence, we are faced with a dilemma: if w is indeed a possible world, then w' cannot be the actual world (since, if w' were the actual world, w would be an impossible world); if, on the other hand, we insist that w' is the actual world, then w is not a possible world. To make more vivid this point consider the following principle

(24) $p \rightarrow A\Diamond p$

If p , then it is actually the case that it is possible that p

⁶ See Davies and Humberstone (1981).

⁷ These two ways to interpret ‘actually’ appear to be akin to the different behaviour that ‘actually’ has in the theories that Predelli and Stojanovic (2008) call ‘SR’ and ‘Classical Reduction’.

(24) strikes as a valid and necessary principle. Consider in fact a possible situation in which p is the case and then imagine that p is actually impossible. If p is actually impossible, then p is impossible. If p is impossible, however, it follows that the situation in which p is the case is not a possible situation, so that it is indeed true that in any possible situation if p is the case, then it is actually possible that p .⁸ However, in the presence of an accessibility relation as the one defined above, if we do not require the pairs of worlds $\langle w, w' \rangle$, to which sentence truth is relativized, to be such that w is accessible from w' , (26) turns out to be invalid: it is sufficient to choose a pair of worlds $\langle w1, w2 \rangle$ such that $w2$ has no access to $w1$ and p is false in every possible world accessible to $w2$ but true at $w1$.

I conclude, therefore, that in the case of a ‘relativist’ two-dimensional logic with an accessibility relation R defined as explained above, the requirement that the pairs of worlds $\langle w, w' \rangle$ to which sentence truth is relativized be such that w is accessible from w' is not only not an *ad hoc* constraint, but it is indeed required both by the intended meaning of the notions in play and by the intuitive validity of principles like (26).

In the case of two-dimensional modal logic we are interested in the truth-value of sentences across the modal space of *possibility*. Hence, if the actual world is not absolute, the extension of the modal space will be determined and delimited by the world we are considering as actual. In the case of RTL, instead, we are primarily interested in the truth-value of sentences across *time*. Hence, if the actual history is not absolute but relative to moments, we first need to fix the time-line we are considering as actual in order to be able to evaluate the truth-value of sentences *along that time-line*.

I conclude, therefore, that far from being an *ad hoc* patch to RTL, the requirement that the context of utterance lie on the thin red line of the context of assessment is perfectly in keeping with the spirit of True-Futurism and is

⁸ These lines of reasoning mimic the Ramsey’s test for conditionals (see Ramsey 1929) especially in the interpretation given by Stalnaker (1968). Notice that this kind of reasoning is insufficient to prove the validity of the principle ‘ $p \rightarrow Ap$ ’ which is invalid in the ‘basic’ two-dimensional modal logic for the actuality operator: the fact that in a possible situation p is the case doesn’t suffice to conclude that, therefore, p is actually the case.

indeed mandated by the idea that the thin red line in the branching tree of historical possibilities is relative.

3.3 Relative truth, Truth-Value Links and Counterfactual Indeterminacy

For what concerns the Truth-Value Links, the doubly relativized notion of sentence-truth calls for their revision. Take, for instance, (TVL). Its most plausible counterpart in this relativistic framework appears to be the following:

(TVL2) For every triple of moments $\langle m1, m2, m3 \rangle$, such that $m2$ is later than $m1$ and such that $m1$ and $m2$ both belong to the relative TRL of $m3$, if p is true at $\langle m2, m3 \rangle$, then ‘ Fp ’ (‘It will be the case that p ’) is true at $\langle m1, m3 \rangle$

The idea is the following: within this framework sentence-truth is relative not only to the moment in which a sentence S is uttered or used, but also to the moment from the standpoint of which the truth value of S is assessed; the Truth-Value Links, on the other hand, are principles intuitively governing the truth-value of tensed sentences with respect to different times *belonging to the same history*. As a matter of fact, from the “internal” point of view of someone located at a certain moment in the tree of time the Truth-Value Links look, for instance, as follows:

(TVL3a) If S is true then ‘WILL: S ’ was true

(TVL3b) If S is true, the ‘WAS: S ’ will be true

Clearly, what is marked by the tense of (TVL3a) and (TVL3b) is a reference to the *actual* past, present and future, respectively. In this framework, however, actuality is an *assessment*-sensitive notion, since the ‘actual’ history is nothing but the relative TRL of the moment of assessment. Therefore, the Links should be valid only for moments of utterance lying on the R-TRL of the moment of assessment in question.

In other words: our temporal standpoint (the context of assessment we are located in) represents a perspective from which sentences are evaluated with respect to moments. This perspective determines a unique actual history (the R-

TRL of the moment in question). Within this temporal point of view, a set of Truth-Value Links holds between different tensed sentences and different moments *lying on the history which from the current temporal standpoint is the actual one*.

Consider again the situation depicted in figure 9:

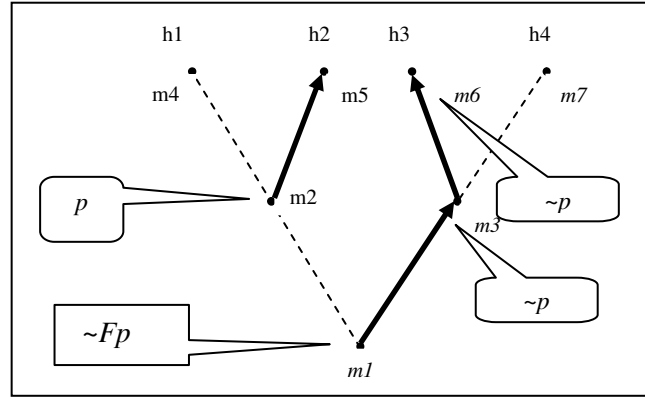


Figure 10

This model is a counter-example to (TVL) in the OR-TRL theory, since p is true at $m2$ and Fp is false at $m1$. However, for every moment of assessment m such that $m1$ and $m2$ lie both on $trl(m)$, it is easy to see that p is true at $\langle m2, m \rangle$ and Fp is true at $\langle m1, m \rangle$. As a matter of fact, the moments such that $m1$ and $m2$ lie both on their relative TRL are $m2$, $m4$, and $m5$, whose relative TRLs are $h1$ and $h2$. We have thus on the one hand that

$$(25) \quad p \text{ is true at } \langle m2, h1 \rangle \text{ and at } \langle m2, h2 \rangle$$

$$(26) \quad Fp \text{ is true at } \langle m1, h1 \rangle \text{ and at } \langle m1, h2 \rangle$$

and, therefore, that for any moment m belonging to $\{m2, m4, m5\}$

$$(27) \quad p \text{ is true at } \langle m2, m \rangle \text{ and } Fp \text{ is true at } \langle m1, m \rangle$$

The last point to consider concerns (A3). Also in this case, the R-TRL theorist appears to have the resources to accommodate the intuitions bolstering (A3). Within our relativist R-TRL theory truth is doubly relativized in such a way that when moment of utterance and of assessment are connected, the

relevant history is provided by the moment of assessment. Therefore, in this framework the question

- (Q1) Had m belonged to the TRL, what would have been the truth-value of S at $t(m)$?

which is understood as

- (Q2) What would have been the truth-value of Fp at m_2 , were m_2 to have belonged to the actual history?

is translated as:

- (Q3) What is the truth-value of Fp taking m_2 as the moment of utterance and as a moment of assessment a moment m such that m_2 belongs to the relative TRL of m ?

In other words: since in this relativist R-TRL theory which history is the actual one depends on which moment is the moment of assessment, the question about what would have been the truth value of Fp at m_2 , were m_2 to have become actual, *depends on which moment we are considering as the moment of assessment of the truth value of Fp at m_2* . Since the question we are considering mentions only a sentence— Fp —and a moment— m_2 , it is natural to understand the truth-conditions of

- (28) Fp would have been true at m_2 were m_2 to have become actual

as follows:

- (29) (28) is true iff for every moment m such that m_2 belongs to $trl(m)$, Fp is true with respect to m_2 (taken as moment of utterance) and m (taken as moment of assessment)

In other words: in our relativist R-TRL framework, in order for a moment of utterance m to be actual (that is: to belong to the TRL), the moment of assessment m' must be such that m belongs to $trl(m')$. In the case of m_2 , however, there are three moments that satisfy these conditions and, therefore, three ‘scenarios’ in which m_2 is actual (that is: belongs to the actual history). It

is thus natural to take (30) to be true if, and only if, in *all* these scenarios *Fp* is true. Clearly, the same goes with

(30) *Fp* would have been false at *m*2 were *m*2 to have become actual

Therefore, since only in some of those scenarios *Fp* is true with respect to $\langle m2, m \rangle$ (where *m* is the moment of assessment in question), we have that

(K1) If the circumstances represented by *m* had obtained, then '*Fp*' would have been true

and

(K2) If the circumstances represented by *m* had obtained, then '*Fp*' would have been false

are false and, therefore, (A3) is true. However, since in every such scenario '*Fp*' is either true or false, (A2) turns out to be true so that, also in this case, Factual True-Futurism is vindicated.

4 Conclusion

With the exposition of ATL and RTL we have concluded the quest for an adequate true-futurist logic began in chapter 5. In the process, we have acknowledged the philosophical significance of the problem of counterfactual evaluation, ruled out Counterfactual True-Futurism as an option for true-futurist and understood that the notion of relative thin red line doesn't *per se* commit to Counterfactual True-Futurism (as one might have initially thought). At the end of this journey, we can then see that at least ATL and RTL represent two adequate and plausible true-futurist theories overcoming the problem of counterfactual evaluation.

At this point, however, two questions call for an answer:

- What kind of general metaphysical lesson—if any—can be drawn from ATL and RTL? Do ATL and RTL respectively point to some metaphysically interesting feature of time in an open future setting?

- ATL and RTL appear both to comply with all the *desiderata* for an adequate true-futurist logic. How should we choose between ATL and RTL? What kind of metaphysical assumption about the open future might justify the choice of one theory over the other?

Those questions shall be answered in the following chapter.

Chapter 8

The Metaphysics of the Thin Red Line

1 Introduction

In the previous chapters I have defended True-Futurism from some alleged logico-semantic problems apparently stemming from the very position of a (relative or absolute) thin red line in a branching framework. The upshot of my analysis is that there are at least two true-futurist theories capable of complying both with:

- (i) the unrestricted validity of the principle of bivalence;
- (ii) the validity of linguistic and meta-linguistic principles intuitively governing our temporal discourse, such as (PF);

$$(PF) \quad p \rightarrow PFp$$

if p, then it was the case that it would be the case that p

and the Truth-Value Links;

- (iii) the falsity of what I have called *counterfactuals of openness*, that is counterfactuals of the form

If m had obtained, then S would have been true(false)

where m is a counterfactual moment and S is a future-contingent statement with respect to m .

Those two theories—that I have labelled ‘ATL’ and ‘RTL’, respectively—correspond to the distinction between the notions of an *absolute* and *relative* thin red line in the open future: whereas in one case (ATL) a single history is marked as actual in the tree of branching possibilities, in the other case (RTL) every moment m in the branching tree of time has its own actual future.

What now remains to be discussed is the relation—if any—between the formal theories presented in the last chapter and the various metaphysical pictures purporting to model the open future.

2 Some definitions

Let us firstly introduce the following definitions:

- A metaphysical theory for the open future is *modal realist* if the possible histories are thought of to be ontologically on a par: past, present and possible futures are all real and concrete in the same sense.
- A metaphysical theory for the open future is *dynamic* if it posits the existence of a privileged *present* and together takes the identity of the present to shift ‘as time passes’

The main theories of time I will consider will be the following: *presentism*, the *growing-block theory*, the *shrinking-tree theory*, *eternalism* and the *Lewisian branching-time theory*. We can catalogue them in the light of the dynamic/static, modal-realist/non-modal-realist distinctions as follows:

- Presentism and growing-block theory are both dynamic and non-modal-realist: according to both there is a privileged (and

‘moving’) present; presentists think that only the present exists; GB-theorists think that the future doesn’t exist.

- The shrinking-tree theory is both dynamic and modal-realist: ST-theorists hold that past, present and all possible futures exist; however, they also uphold that the ‘passage of time’ consists in the progressive ‘falling-off’ or annihilation of all but one among the lowest branches in the branching-tree of historical possibilities
- Eternalism is static and non-modal realist: for eternalists, ‘past’, ‘present’ and *only one* ‘future’ exist, although no time is privileged as *the* present (and *a fortiori*, as the ‘moving’ present).
- The Lewisian ‘Branching-Time’ Theory is both static and modal-realist: for LBTT-theorists ‘past’, ‘present’ and all the possible ‘futures’ exist, but no privileged present exists.

3 Absolute TRL

ATL is an *absolute*-TRL theory: only one history in the model is singled out as *the* history that will actually obtain. There appear to be two main ways to make intuitively sense of the privilege the absolute TRL has with respect to all the other histories. Let us review them in turn.

The first and most immediate way to make intuitively sense of the privilege the absolute TRL has with respect to all the other histories is the *eternalist* one: the absolute TRL is privileged since it represents the *only concretely existing* history, where instead all the merely possible histories are only *abstract representations* of the way things might have turned out to be. This appears to be the strongest way in which a history might be singled out as the thin red line in an absolute thin red line framework.

The second is the *dynamicist* one. Presentists, GB-theorists and shrinking-tree theorists disagree about whether possible histories are to be understood

realistically or not (that is, whether, possible histories are concrete lewisian worlds or whether they are only ersatz construction—for instance, sets of propositions). However, they all agree on the fact that reality has as an objective and mind-independent *dynamic* character:

- for presentists, temporal becoming is the process of going out and coming into existence of different sets of (present) entities;
- for GB-theorists, the objective temporal passage consists in the progressive increasing of the world-block by means of new temporal slices;
- for shrinking-tree theorists, the passage of time is the process in which more and more branches in the branching tree of historically possibilities fall off.

In each case, there is a single history in the branching tree of historical possibilities such that it represents the history progressively ‘selected’ by the objective passage of time:

- the history representing all and only the possible state of the world that will successively obtain, for the presentists
- the history representing all and only the temporal slices that will come into existence, for GB-theorists
- the concrete history that won’t lose any ‘segment’ in the process of annihilation of possible branches from the branching multiverse of possibilities, for shrinking-tree theorists

In chapter 1 I have put forward an argument to the effect that the moving spotlight theory of time is incompatible with the open future. The moving

spotlight theory posits the existence of an objective property of presentness that ‘moves’ from earlier to later (concrete) times. Presentism, GB-theory and shrinking-tree theory do not admit such a property within their theories. However, they all believe in an objective form of presentness that changes—and, hence, in some sense ‘moves’—in time or, better, whose change is what temporal becoming consists in. For all of them, therefore, there is a point in the branching tree of possibilities that represents ‘the present’. Since for all of them, although ‘presentness’ is not a fundamental property of reality, the present *was* indeed different and *will be* different, we can call such a point the *ersatz moving spotlight* to distinguish it from the *real* moving spotlight featuring in the moving spotlight theory. The notion of an ersatz moving spotlight allows us to make better sense of the privilege that the absolute TRL enjoys within ATL: the absolute thin red line is nothing but the path taken by the ersatz moving spotlight in the branching tree of historical possibilities or, in other words, it is *the history representing all and only the moments that either are, were or will be present*.

4 Relative TRL

RTL is a *relative* TRL-theory, which means that according to it no history on the branching structure is *absolutely* privileged over the others. For this reason, this kind of theory appears to suit better LBTT-theorists unwilling to deny the validity of the principle of bivalence for future-contingent statements.

4.1 Branching worlds and relative truth

There appears to be a *tension* between the unrestricted validity of the principle of bivalence and LBTT:

- on the one hand, in a branching setting the idea that future-contingent statements have a determinate truth-value calls for the notion of a thin red line, since the set of true future-contingent

statements at a given moment picks one of the possible future courses of the event as the one that ‘will obtain’;

- on the other, however, the idea of an *absolute* TRL appears to be at odds with the ‘ontological even-handedness’ of a LBTT-setting: If all the histories are ontologically on a par and no ‘temporal flow’ selects a unique history on the branching tree, how can a unique history be singled out as *the* actual history? And furthermore: what kind of property is that of *being actual* in a framework in which all histories exist *simpliciter*?

The idea of a *relative* TRL seems to provide a possibly feasible solution to the factual true-futurist and LBTT-theorist. *True*—she can say: no history is ontologically privileged; but the existence of a privileged history is not necessary to guarantee the truth of Factual True-Futurism. What is sufficient—she might continue—is only that every moment bear a particular relation (the ‘R-TRL-relation’) to a single history ‘passing through’ that moment, making it the ‘true-history’ of the moment in question. The FTF&LBTT-theorist can thus maintain both the principle of bivalence and that—at the bottom—no history is in any sense absolutely privileged over the others. The only privilege in this framework is *contextual*: given a certain moment m , a certain history h is singled out among the set $H(m)$ of the histories ‘passing through’ m . However, this doesn’t amount to a hierarchy in existence or reality among those histories, but only to the fact that a specific relation obtains between a certain history h belonging to $H(m)$ and the moment in question.

4.2 The grounding problem

Being a true-futurist, the FTF&LBTT-theorist is committed to claiming that the fact that a certain history h is the relative thin red line of a certain moment m is not something that is grounded in what entities exist at m or in the particular

pattern of instantiation of fundamental properties and relations obtaining at m .¹ h 's being the thin red line of m is, in other words, a *brute fact* with respect to m . To this respect, the FTF&LBTT and the other metaphysical pictures of time appears to be in the same boat for what concerns the *grounding status relative to m* of true future-contingent statements.

However, a striking difference with the other theories of time appears to emerge once we consider the *absolute* grounding status of true future-contingent statements in a FTF&LBT framework. Consider, for instance, Non Modal-Realist Eternalism: for the eternalist it is true that nothing, at a moment m , grounds the truth of, say, 'event e will obtain tomorrow'. However, there is something—beyond the population of entities and the properties and relation instantiated at m —that grounds such a truth: the fact that one day later than m e exists at m' (which is the moment lying one day later than m on the actual world). 'event e will obtain tomorrow' is thus *grounded*, although not *locally grounded* (there is, in other words, something grounding the truth-value of 'event e will obtain tomorrow' as uttered at m , although it is not temporally located at m).

The case of dynamic theories of time is somewhat trickier. Consider, for instance, presentism and the growing-block theory. Those theories belong to the group of no-futurist theories, that is the theories according to which the future doesn't exist. For a no-futurist there can be—*by definition*—nothing in the domain of our most unrestricted quantifier grounding the truth of a future-contingent statement. It seems thus that no-futurist must be committed not only to the thesis of local ungroundedness of future-contingent statement, but also to the less appealing thesis of their being *simpliciter* ungrounded: how can, in fact, future-contingent statements be in any way grounded if they cannot be grounded by the present or by the past (on pain of the future's being settled) and the future does not exist?

However, although the issue is surely one that no-futurists cannot refuse to address and, perhaps, such to force them to bite the bullet and take true future-contingent statements to be absolutely ungrounded truths, no-futurists appear to

¹ See chapter 1.

have at least something to cling to in order to at least try and dodge the grounding objection. As a matter of fact, no-futurists are ‘dynamicists’, that is they uphold—along with other kinds of theorists of time—that reality has a fundamental and mind-independent *dynamic* character, that is the one we usually refer to as ‘temporal becoming’. The fact that a certain future-contingent statement *S* is true should thus ‘depend’ for dynamicists on the fact that things *will indeed unfold*, as time will—literally!—*go by*, as *S* predicts. Surely, the objective temporal flow is not a ‘thing’. Temporal becoming does not appear, in other words, to be something we can quantify over in order to meet the grounding objection. However, the dynamicist might continue, it is nevertheless *real*. Even if it is true to say that there is no *x* such that *x* is identical with the temporal becoming, it is true to say that reality has dynamic character, time literally flows and things constantly unfold in a certain way.

Surely, whether dynamicists can develop this kind of insight—which seems to draw a wedge between *existence* (intended as membership in the domain of our most unrestricted quantifier) and *reality*²—into a fully intelligible, stable and consistent rebuttal of the grounding objection is surely moot. However, they at least appear to have a story they can try and tell about the connection between future-contingent statements and reality; a story that does appear to have an at least *prima facie* intuitive appeal: future-contingent statements are indeed—in a certain relevant sense—ungrounded, but they still reflect and mirror a certain *objective feature* of reality, that is the fact that things will indeed unfold in the way they predict in the objective and mind independent ‘flow’ of time.³

FTF&LBTT-theorists find themselves in a peculiar predicament with respect to the grounding objection. Not only they cannot appeal to any ontological privilege of the thin red line over other histories (as eternalists do): they also cannot invoke the notion of an objective temporal becoming that objectively ‘selects’ one history among all those that are historically possible at

² On this point see, for instance, Caplan and Sanson (2010).

³ Although I focus here on no-futurism, this argument clearly extends to any kind of dynamic theory of time.

a given moment m (as dynamicist might try to do). It seems thus that the only possible option for FTF&LBTT theorist is that of biting the bullet and claiming that future-contingent statements are *absolutely ungrounded*, in the sense that there is no feature of reality whatsoever that is mirrored by their truth-value. This seems to be, for instance, the route taken by Patrick Greenough (ms.), who in fact considers true(/false) future-contingent statements to be indeterminately true(/false), where (roughly) a true(/false) statement is indeterminately true(/false) if, and only if, it is true(/false) but absolutely ungrounded. I think, however, that there might be another way for FTF&LBT-theorists to face the grounding objection without committing them to the existence of absolutely ungrounded truths: it is the idea of an *oriented multiverse*.

4.2 A possible solution to the grounding problem: the oriented multiverse

In order to understand what it is for the multiverse to be oriented a spatial metaphor might be useful. Let us take, for simplicity's sake, time to be discrete. For all moments m there is thus a moment m' such that m' is earlier than m and no moment m'' is both earlier than m and later than m' . By picturing the multiverse as a two-dimensional plane, we can imagine moments to be connected one to another by a rectilinear segment. Consider then the following toy branching multiverse. Moment m_1 is the closest moment to moment m_2 in the past. There are three possible histories branching off m_2 , leading to moments m_3 , m_4 and m_5 respectively. However, only the segment going from m_2 to m_4 lies on the same straight line on which the segment going from m_1 to m_2 lies. To say that the multiverse is oriented is then to say that every moment m in the multiverse is like m_2 , that is: every moment m is such that there is a unique possible future (=segment of history) such that it lays on the same 'straight line' on which the segment going from m to the first moment in its past lays. Such an history is the relative thin red line of m .

Another way to present the idea of an oriented multiverse might be the following: Within an eternalist setting, the world-block is thought of as a 4-

dimensional worm, where the first three dimensions are spatial and the fourth is time. In a branching setting, we can think of the branching multiverse as a (n at least) 5-dimensional tree composed of a plurality of 4-dimensional worms. We might call the fifth dimension ‘possibility’. Every moment in the multiverse can thus be individuated by a pair of coordinates $\langle x, y \rangle$, where x is the *time-coordinate* and y is the *possibility-coordinate*. To say that the multiverse is oriented is therefore just to say that there is a three-place topological relation R , such that for every moment m (having coordinates $\langle x(m), y(m) \rangle$), there is a unique moment m' , such that m' is later than m and the relative thin red line relation R holds between $\langle x(m), y(m) \rangle$, $\langle x(m'), y(m') \rangle$ and $\langle x(m''), y(m'') \rangle$, where m'' is the first moment in the past of m .

In an oriented branching multiverse, in other words, although many concrete possible futures branch off every moment m , with no future being privileged over the others, only one future bears a certain *topological* relation with m and its most recent past. The following analogy might help: imagine coming by car to an intersection X from city A . At X you can take different roads, leading to cities B , C , and D . However, coming from city A you have the road going to city C right *in front* of you, so that you do not need turn either left or right, in order to take the road that leads you to city C . In an oriented multiverse moments are like intersection X . They have many possible futures, all ontologically on a par, but they all have a unique future ‘in front of them’, which is their relative thin red line (their relative ‘actual’ future).

The FTF&LBTT-theorist can thus fully satisfy the grounding requirement for future-contingent statements by invoking the idea of oriented multiverse. It is the *particular orientation* of the multiverse that grounds the truth of a future-contingent statement S at a certain moment m . The fact that the possible future f is the relative actual future of m depends on a certain objective feature of the multiverse, that is its being oriented in a way that makes m facing f , despite its being but one of the many possible and equally existing futures of m . This feature, however, does not depend either on the population of entities existing at m or on the properties and relations that are instantiated at m , so that the specific ontological configuration of m is in itself insufficient to single out f as

its true future and, consequently, to jeopardize the idea of objective unsettledness of its future.

5 Linear time—branching possibilities

In this essay I have been assuming that the idea that the future is objectively open is to be modelled by means of branching structures, as it is indeed customary. However, in the literature on the open future this interaction between temporality and branching models often short-circuits engendering the unfortunate phrase ‘branching time’, which is sometimes even thought of as an equivalent label to ‘open future’. As it should be clear from what has been said so far, however, the idea of a branching *time* is not only not entailed by the idea that the future is open but it appears to be indeed incompatible with it.

For a true-futurist the principle of bivalence is valid even if the future is open. But to say that the principle of bivalence is valid is to say that there is a *unique* future that will indeed obtain (if contingently) and, hence, a unique temporal *line* representing the actual history and the state of the world that obtain at each time. In other words, the principle of bivalence for future-contingent statements clearly entails that time is not branching, but linear, since what branches is only what we are calling historical possibility.

It is, however, the very idea that the future is *open* that appears to actually presuppose the linearity of time. To say that *the* future is open appears in fact to be equivalent to saying that *the only way* the future will turn out to be is presently unsettled and/or under-determined. The idea that the future *itself* branches appears, instead, to be equivalent to saying that while there is only a unique ‘today’ (at least from the point of view of today)⁴ there will be *many* ‘tomorrows’, since *time itself* is branching from the present moment onwards. If, however, there are many tomorrows, then I do not see in which sense we can genuinely say that the future is ‘unsettled’. To the contrary, it seems to me that in this case we should instead say that the future is *settled*, since it is

⁴ If *time itself* branches, then, from the point of view of yesterday, there are many days lying one day in the future and so, in a certain sense, ‘this’ today is but one of many ‘todays’.

indeed now settled not only that there will be many tomorrows one day from now but also what will happen at each tomorrow. Within a branching time setting the future could be open, only if it were now unsettled which plurality of tomorrows will obtain one day from now among the set of now-possible pluralities of tomorrows. It seems, in other words, if the future itself is branching, either it is presently unsettled how it will actually branch, or it is simply *not* genuinely open.

This train of thoughts should be valid even for gappists. To say that future-contingent statements are neither true nor false seems, in fact, to be simply equivalent to saying that *the* future—the *unique* set of linearly ordered ‘temporal stages’ that will actually follow the present one—is presently *empty* or, in the best case, *indeterminate*. It is, in fact, this kind of emptiness or indeterminacy of the future what seems to lead gappists to conclude that, therefore, if a future-directed statement is now historically contingent, it now is gappy, since there is either nothing to make it true(false) or nothing that is sufficient to determine its truth-value.

These lines of reasoning might be made more vivid by means of the following *trilemma*:

Consider the statement

(F) The future is such that p

made in a branching-time universe, where some futures are such that p and others are such that $\sim p$. I see three main possible options to understand (F):

- as a *complete definite description*

(F1) There is a unique future f , and f is such that p

- as a *simple existential statement*

(F2) There is a future f , and f is such that p

- as an *incomplete definite description*

(F3) The future f is such that p

However:

(i) if (F) is understood as a complete definite description it should turn out to be *false*, since there is no unique future in a branching time setting;

(ii) if (F) is thought of as a simple existential statement, then it is true, but in that case it is also true to say that

(G) The future is such that $\sim p$

(iii) if, finally, (F) is taken to be an incomplete definite description (as ‘the book is on the table’ in a context in which there is in fact plenty of books), then one might indeed apply supervaluationist techniques and say that since (F) is not true(false) in every precisification, it is neither true nor false. In this case however, it seems apparent that it is not the future that is unsettled, but instead ‘the future’ that is incomplete. If I utter ‘the F is G ’ and not only there are many F s, but some are G and some not, you might well decide to treat my utterance as neither true nor false, but that would hardly legitimise you to infer the existence of some form of objective ‘openness’ in reality for what concerns F -ness.

Clearly, the first two options (according to which either every future-contingent statement of the form of (F) turns out to be false or (F) and (G) turn out to be both true) are to be rejected straight away. The only remaining option is the third one, according to which, although there might indeed be a class of future-directed statements that are neither true nor false, the future is *not* objectively unsettled.

I conclude, therefore, that the trilemma just presented, together with the considerations put forward above, suggest that the very idea of an open future requires time to be linear.

6 Conclusion

In this chapter I have tried to make metaphysical sense of the two factual true-futurist theorist exposed in chapter 6. I have shown that the choice between ATL and RTL depends on which metaphysical picture of time is assumed as the correct one. In addition, I have sketched a way for static and modal realist theorists to overcome the threat posed by the grounding objection and, finally, I have stressed once again that one of the important lessons to be learned from my discussion of the open future is that the openness of the future does not entail, and indeed appears to be incompatible with, the idea of a branching time.

Chapter 9

Conclusion

In this essay, I have defended the thesis according to which the principle of bivalence is valid for future-directed statements, even if the future is open in some robust, objective and mind-independent way; a thesis that, following the recent literature, I have called ‘True-Futurism’. The core of my discussion has consisted in two main steps:

- (i) First, I have advanced a positive argument to the effect that future-contingent statements are either true or false (chapter 2). The argument relies on what I have called the ‘principle of retrospective determinacy’ according to which, if (for instance) today is a sunny day, it is correct to say that it was true yesterday that today would be a sunny day. Briefly stated, my argument was the following: future-contingent statements are either necessarily truth-valued (either true or false) or necessarily gappy (neither true nor false); if yesterday it was true that it would be sunny today and the future was open as to whether it would be sunny today, it follows that there was a situation in which a future-contingent statement (‘It will be sunny tomorrow’) is truth-valued; hence, it is false that future-contingent statements are necessarily gappy and, therefore, they are necessarily truth-valued
- (ii) Second, I have put forward two different true-futurist theories to make logico-semantic sense of the idea that future-contingent statements are necessarily truth-valued. Those theories (which I have dubbed ‘ATL’ and ‘RTL’) rely on the notions of an absolute

and relative thin red line, respectively. The central idea common to both theories is that, in order to comply with all the intuitive *desiderata* of a true-futurist theory, one has to rely on a *linear* set of temporal points, in order to evaluate the truth-value of sentences. If the actual history is thought of to be absolute (as it is the case of an *absolute* thin red line framework), then sentence-truth is to be thought of as relative to *times* (understood as ‘horizontally’ dividing the branching tree of historical possibilities). If, instead, the actual history is thought of to be relative to moments (as it is the case in a *relative* thin red line framework), then sentence-truth has to be relativized to moments, but only *from the perspective* of other moments, whose function is, indeed, that of determining the relevant ‘local’ actual history. In the final chapter, I have then argued that the choice between ATL and RTL depends on which kind of metaphysics of time is thought of as to be the correct one. More specifically, I have argued that RTL should be chosen for static and modal-realist theories of time and that ATL fits dynamic and non modal-realist theories better.

Furthermore, I have also argued that true-futurists are committed to the following thesis:

- *Definite-Futurism*: future-contingent statements are either *definitely* true or *definitely* false (chapter 3)
- *Factual True-Futurism*: there are no true ‘counterfactual of openness’, that is counterfactuals of the form ‘If the merely counterfactual moment *m* had obtained, then the future-contingent statement *S* (with respect to *m*) would have been true(/false)’ (chapter 5)

In addition, along the path that has lead me to conclude that True-Futurism is the true theory of the open future, I have also argued for the following claims:

- (a) The kind of relativism about truth recently advocated by MacFarlane is unnecessary within a gappist theory for the open future (chapter 1)
- (b) There are plausible reasons to suppose that, at least in a branching setting, ‘actually’ is a ‘nonindexical’ operator (chapter 1, §7)
- (c) The so-called ‘moving-spotlight’ theory of time is incompatible with the future’s being open (Introduction, §2.6.2)
- (d) Contrary to what has been recently suggested in the literature, determinism is incompatible with the open future (Introduction, §2.4)
- (e) There are reasons to suppose that, at least given certain metaphysical assumptions, future-contingent statements are ungrounded (Introduction, §2.6.1) or, at least, indeterminately grounded (Introduction, §2.6.2; chapter 3, §3)
- (f) Those theorists of time who embrace a lewisian branching-worlds picture of time might overcome the grounding problem by appealing to the idea of an ‘oriented multiverse’ (chapter 7, §4.2)
- (g) It is the very idea of an open future that requires time to be linear (chapter 2, §11; chapter 7, §5)

In this essay I have not defended True-Futurism from arguments aiming at establishing that the principle of bivalence is *incompatible* with the open future. However, the main aim of this essay was to produce a *positive* argument for True-Futurism and, then, to show how the true-futurist intuition could be formally accommodated within a well-defined logico-semantic framework.

That said, it must be stressed that the main result of this essay is, in fact, conditional:

If the future is open, then future-contingent statements are truth-valued

This means that, if it were possible to prove that

If a statement is truth-valued, then it is not historically contingent

it would then follow that the future is *not* open, but settled. However, the question about whether the future is indeed open, in the way I have supposed it to be, goes beyond the scope of this essay and must, therefore, be left for a (possibly possible) future occasion.

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